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THE SCOTTISH GEOGRAPHICAL MAGAZINE

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Branches of the Society have been established in Glasgow, Dundee, and Aberdeen, where periodical Meetings are held.

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ERRATA.

Page 138, line 18 from bottom, *for* Sa-chan or Sha-chan *read* Sa-chau or Sha-chau.
,, 145, ,, 11 from bottom, *for* Tricentenary *read* Tercentenary.
,, 259, ,, 12 from bottom, *for* by *read* from.
,, 315, ,, 6 from bottom, *insert* three *before* hundred.
,, 336, ,, 16 from bottom, *for* expedition *read* two expeditions ; and in the next line *for* 1884-85 *read* 1884 and 1885.
,, 341, ,, 14 from top, *for* 20 *read* 70.
,, 344, ,, 9 from bottom, *for* coast *read* east.
,, 346, ,, 12 from top, *for* 900 *read* 800.
,, 347, ,, 20 from top, *for* flow *read* floor.
,, 350, ,, 22 from top, *for* geographical *read* geological.
,, 351, ,, 5 from top, *for* groups *read* group.
,, 355, ,, 4 from top, *for* their *read* these.
,, 356, ,, 12 from bottom, *for* balsam, poplar *read* balsam-poplar.
,, 357, ,, 13 from bottom, *for* (*Isuga Canadensis*) *read* (*Tsuga Canadensis*).
,, 358, ,, 3 from bottom, *after* Ungava *insert* district.
,, 359, ,, 7 from top, *for* for *read* from ; and line 9 from bottom, *for* win-iwish *read* win-inish.
,, 360, top of page, to list of fishes *add* gold-eye ; and line 6 from bottom *for* ports *read* posts.
,, 422, line 16 from top, *for* Gonikora *read* Gouikora.
,, 542, ,, 6 from top, *for* Rev. W. Watson *read* Rev. W. Weston.
,, 556, ,, 18 from bottom, *for* three *read* two ; and line 9 from bottom *for* Kuhow *read* Kukow.
,, 559, ,, 2 from top, *for* covered *read* capped.
,, 565, ,, 5 from top, *for* Awe-poonniek *read* Awetoh-poonniek.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ANNIVERSARY ADDRESS.

(*Read at Edinburgh, November* 12, 1894.)

THE ECONOMIC DEVELOPMENT OF CANADA.

By Sir Charles Tupper, Bart., G.C.M.G., C.B.,

High Commissioner for the Dominion.

(*With Maps.*)

In addressing Scotchmen on Canada I do so with the pleasant assurance that I shall have not only an interested and sympathetic audience, but what is rarer still, one thoroughly instructed in all that relates to the past and present progress of that country. This interest does not date from yesterday. Scotchmen took a very early and very practical interest in the affairs of British North America. Sir David Kirke, you will remember, captured Quebec in 1629. To the fanciful and well-intentioned but abortive scheme of colonisation, in 1621, of Sir William Alexander, who became, later, Lord Stirling, we owe the fact that Scotland's name was given to Canada's peninsular province, Nova Scotia. And on from those early days to the present there is hardly any other part of the British Empire that owes more to Scotland's sons than Canada. Whether as explorers or simple colonists, merchants or administrators, they have left an enduring impression on the fortunes of the country; and none more so than my friend and colleague, the late Right Hon. Sir John A. Macdonald, one of the most illustrious and honoured names of Canada and the Empire. Another distinguished son of Scotland, the late Hon. Alexander Mackenzie, was Premier of Canada for five years.

As I take for granted the general acquaintance of this audience with the geography of Canada, I will only trouble you with the briefest outline of any of those facts that may be necessary to illustrate the remarks I desire to submit to you in connection with the influence which the

geographical conditions of the Dominion have exercised on its economic and political development.

Much of the early enterprise towards America may be attributed to the search for a North-west Passage to the East, as an alternative route to that by way of the Cape from which Portugal and Spain jealously excluded all other nations. If you look at the map you will observe that the orientation of the continent of North America is most pronounced towards Europe. The two greatest breaks in the Atlantic coast-line north of Florida, are the Gulf of St. Lawrence, and Hudson's Strait and Bay. They lie right in the course of vessels sailing to the west from the United Kingdom and from France. The early English and French navigators were not slow to explore these openings, and, following them for days, fondly believed that they had come upon the great object of their search—the short route to the East by the West. They were doomed to disappointment; but they had unwittingly discovered Canada's domain, vaster and more valuable than any they dreamed of. They did not discover the North-west Passage; and yet, in one sense they did. But it was left to the genius of the British and French races, whom these navigators represented, to convert, three centuries later, their discovery, with the assistance of a great trans-continental line of railway, into the true north-west passage of the present day.

I suppose it is impossible to over-estimate the influence which the fur trade has exercised on the destiny of Canada. At the outset, the exploitation of the fur trade was the sole *raison d'être* of the early occupation of the country on behalf of France by the chartered company of the Hundred Associates. It was the cause also of the occupation of the northern and western interior by the Hudson Bay Company. Colonisation had no place at first in the French scheme, and was only encouraged, within limits, later on, after the assumption of the affairs of New France by the Crown. Even then, the prosecution of the fur trade was found to constitute a real impediment to settlement: the life of excitement and adventure it offered demoralised the younger men in the colony, leading them to abandon the work of clearing and to neglect agriculture. But throughout the French *régime* furs were the most important source of revenue upon which the economic existence of the colony rested. The St. Lawrence, with its wonderful series of lakes, and subsidiary rivers and streams, afforded admirable opportunities for prosecuting that trade over an immense extent of country. By its means also exploration was facilitated, and the French obtained at a very early date a much more accurate knowledge of the geography and resources of the interior than would otherwise have been possible, in view of the vast and impenetrable forest that covered the Atlantic division of Canada, and which barred the approach to the fertile prairie regions of the west. The fur trade was also instrumental in opening the eyes of the French to the advantages to be derived from their strategic position in America for securing control of the whole continent. It trained, moreover, large numbers of men in the qualities of courage, endurance, and resource, a circumstance which proved of the greatest value to France in her subsequent struggles with England for the mastery of the continent. Similarly,

the furt rade, as represented by the Hudson Bay Company, was instrumental in securing the early exploration of the larger portion of the interior of British North America, and in preserving it for the Empire, until the time was ripe for its incorporation into the present Dominion of Canada.

When the French *régime* came to an end in 1763, there remained a solid nucleus of French colonists in Quebec, numbering some 70,000 souls. In Nova Scotia, which was already British, the population reached some 18,000 souls. The whole of the North American continent was now British, and there was nothing, seemingly, to disturb henceforward its quiet development. Emigrants poured into the country, mainly, of course, to the New England colonies, and settlement progressed. Twelve years later, at the outbreak of the American Revolution, the population of what is now Canada numbered some 90,000 souls, as against $3\frac{1}{2}$ millions in the revolted colonies. The war, however, led to a considerable addition to the population of Canada in the persons of about 40,000 United Empire Loyalists, as they were called, who crossed the frontier and settled under the Old Flag. What is now Ontario, the premier province of Canada, received its first settlers, some 10,000, from this source; the remainder distributing themselves over Nova Scotia, New Brunswick, and the southern part of Quebec. From that date the British North American colonies made steady progress. The valley of the St. Lawrence soon took the lead, which it has since maintained. The genial climate of Western Quebec, and especially of Ontario, favoured this. In this section there is an area equal to twice that of the British Isles, which has the same climate as France, but with severer winters. Here Indian corn, melons, and tomatoes are raised as field crops; while in the southern part of Ontario, which lies in the latitude of Rome, peach-growing in orchards, and grape-growing for the table and the manufacture of wine, are now amongst the most profitable occupations of the agricultural community. The position of these districts on the lakes and the St. Lawrence facilitated the development of their resources. Similarly, proximity to the sea-board, and open navigation all the year round, moderated the climate and assisted the development of the maritime provinces. The physical geography of the whole of Canada between the Atlantic and the axis of the Rocky Mountains possesses the character of an undulating plain sloping gently to the north. The only elevated tracts of any account are the extension of the Appalachian chain as expressed in the highlands of Nova Scotia and of central New Brunswick; the table-lands of the Gaspé peninsula; and, to the north of the Gulf of St. Lawrence, the plateau of the Labrador peninsula. Stretching inland from the Atlantic coast for nearly two thousand miles is the great forest region of Canada, followed, as we know, by the great Central or Prairie region; and then to the Pacific by the Alpine province of British Columbia.

The whole of the older provinces referred to lay in the forest zone, which intensified the difficulties of early settlement. Everywhere the axe preceded the plough. Nature seems to have challenged, on the threshold, the fitness of each individual new arrival for the life and duties before him. It was a stern apprenticeship they served, but it made strong, self-reliant men. Lumber, fish, and, later on, agricultural produce, as land

was won from the forest, formed the exports of these colonies. Shipbuilding soon became an important industry in Quebec and in the maritime provinces. In the mother-country the staple products of the colonies obtained, under the colonial system then in force, preferential treatment over similar products from foreign countries; and although, on the other hand, the colonists were prohibited from establishing manufacturing industries in textile fabrics or iron, the privilege referred to undoubtedly contributed materially towards the development of the country in its early days. The best index to the strides made by the individual colonies now constituting Canada may be gathered from the population returns at various periods. Taking, then, the population in 1774 at 90,000, it stood at 430,000 in 1806. During the next 36 years the numbers increased nearly threefold; the returns in 1840 being approximately 1,534,000, and in 1867, at Confederation, 3,500,000. At the Declaration of Independence the population of the United States was forty times larger than that of Canada. It is now only twelve and a half times larger. The increase of population has been, in the case of the United States, nineteenfold, and in the case of Canada, fifty-fivefold. An interesting feature in connection with the population returns is the extraordinary growth of the French Canadian element, from 70,000 in 1763 to over a million souls in 1867, without the aid of immigration. This wonderful natural increase furnishes some very interesting points for inquiry into the influence of new surroundings, physical, political and social, on the vitality of the French race in Canada, as compared with the actual position in France. Contrasted with the United States, these results may appear on the surface to be meagre. It must be remembered, however, that the United States started with immense advantages over Canada; firstly, with a population forty times larger; and, secondly, with the accumulated influence of nearly two centuries of British civilisation. Canada, at that time, was in the position of a conquered country in the very earliest stages of development, with an insignificant population alien in race, in language, custom, and religion, to the new-comers; a country where all the aids to progress had to be created. The results achieved so far, therefore, may be taken as highly creditable to the energy of the colonies, both in their individual spheres and also collectively, as I propose now to show.

The political development of this period, it may be mentioned, may be divided into three epochs: the first, the era of the French *régime*, lasted for about a century and a half, from 1608 to 1760. Then came the period from 1760 to 1840, when the provinces, under British rule, slowly increased in population, and gained valuable experience in the working of representative institutions. It was in 1791 that constitutional government was given to the individual provinces. Then followed the important and interesting period from 1840 to 1867, when the political liberties were enlarged with the growing development of the country, and the colonies were given responsible government in the full sense of the term. Since 1867 the various colonies, united as the Dominion of Canada, have entered upon a fourth era, pregnant with promise.

The continued isolation of the provinces meant waste of effort and

the danger of becoming dependent on a foreign power, with the prospect of ultimate absorption. As population grew and wealth accumulated, the absorption in purely local development became less pronounced. British North Americans became more familiar with the true significance of their heritage on that continent, of the future which awaited its development, and were drawn irresistibly towards the elaboration of a plan calculated to promote that end.

The friends of confederation in the maritime provinces determined to take the initiative. Awaiting the adhesion of the larger provinces of Quebec and Ontario, they proposed, at all events, to unite among themselves. In the conference I inaugurated when Premier of Nova Scotia in 1864, held at Charlottetown, Prince Edward Island, the first step forward was taken in that direction. A deputation, however, from the Government of Canada asked to be admitted to that conference for the purpose of presenting the question of the immediate union of all the British North American colonies. They were cordially received, and, after a full discussion of the larger question, the conference was adjourned, to re-assemble in October of the same year in Quebec. Under the sanction of the Crown, the delegates at that meeting agreed upon a basis of confederation ; and at the conference of the several colonies with the Imperial Government, held at Westminster Palace Hotel, London, in 1866-7, the terms of the Act of Union passed by the Imperial Parliament were arranged.

On occasions of this kind, I may seem to refer with needless iteration to this union of the British North American colonies. But to this action is undoubtedly due the present predominant position of the Dominion of Canada within the Empire.

The Act of Union provided for a central Government and Parliament that would deal with all national questions and interests, with provincial governments and legislatures controlling the local affairs of each province. To establish intercommunication was, therefore, the all-important duty of the hour. Nature had given us water communications, but these were liable to interruption, in part, during the winter season. During the winter, Ontario and Quebec had no access by rail to the ocean except through the United States ; and the maritime provinces no communication with the upper provinces by railway or steamers save through the Republic. Modern conditions of development required other and more rapid and independent means of communication. Thus a railway policy became one of the first planks in the platform of confederation. There was no hesitation in carrying this out. The Intercolonial Railway was promptly undertaken, and was opened in 1876. This line connected the railway systems of the upper provinces with those of the maritime provinces, and the Imperial fortress and naval base at Halifax with Quebec. The next step was the incorporation of the Hudson Bay Territory in the Dominion. British Columbia, in 1871, gave in its adhesion to the Union, based upon the extension to the Pacific of the railway system of Canada. Prince Edward Island joined the confederation in 1873, thus completing the union of all the British North American colonies, except Newfoundland, under one government.

The difficulty of securing the means for the extension of the railway to the Pacific in the face of a falling revenue, due to a fiscal system unadapted to the conditions then prevailing, and under which the industries of the country were being paralysed, compelled the adoption of the policy of *incidental protection* by the Liberal-Conservative Government, which returned to power in 1878. The equilibrium between revenue and expenditure was thus speedily restored, and the means provided for the completion of a great inter-oceanic line of railway and of other important works. The contract made by me, as Minister of Railways and Canals, on behalf of the Government, with the Canadian Pacific Railway Syndicate, for the construction of this trans-continental railway, was completed in about one-half the stipulated time, a result largely due to the ability and energy of Sir Donald A. Smith and Lord Mountstephen, both sons of Scotland, and to the sagacity and genius of Sir William Van Horne. That is an achievement of which any country may be proud; especially when it is remembered that the construction of the Union and Central Pacific Railway to San Francisco, by a nation of forty millions, was regarded at the time as an extraordinary accomplishment. Less than one-tenth of that population in Canada undertook single-handed an enterprise equally as arduous, and carried it promptly to a successful issue. The railway system of Canada, which was only 2067 miles in 1867, rose to 12,162 miles in 1888, and stood at 15,020 miles in operation in 1893.

Among other works of public utility, Canada has incurred an outlay of nearly sixty millions of dollars in perfecting the water communications of the country. The greater part of this sum has been expended on the St. Lawrence River, where seventy-one and a half miles of canal works had to be provided in order to overcome the obstructions to continuous navigation. There were canals on this line prior to confederation, but they proved inadequate for the growing size of lake shipping and the needs of traffic. The whole of the works are being reconstructed to ensure a fourteen feet navigation, which will be shortly attained. The last canal on the series, that at Sault St. Marie, between Lake Superior and Lake Huron, has just been opened, and ere long steamers and vessels of 2500 tons burthen will be able to pass through Canadian waters, without breaking bulk, from tide water to the head of lake navigation—a distance of 1274 miles from Montreal, or 2260 miles from ocean navigation at the Straits of Belle Isle. These works include a ship channel, of 28 feet depth at low water, between Quebec and Montreal. The importance of the canals for lake traffic may be imagined when it is stated that the aggregate tonnage of the shipping which passed in 1892 through the present canal at the Sault St. Marie was 11,214,333 tons, during the seven months of navigation, as against 7,712,029 tons which passed through the Suez Canal during the whole year. The completion of the Canadian works will divert to Montreal and the St. Lawrence route a large portion of the produce destined for export from the regions lying within the United States tributary to the Great Lakes, amounting annually to several millions of tons.

In dealing with the trade and commerce of Canada, it is satisfactory to be able to say that Canada has established a record which has

thoroughly justified the hopes and expectations formed by the promoters of confederation. The development of her trade has been steady. It has experienced no great checks, neither has there been any sensational advance. In the aggregate, however, the progress has been very considerable, both relatively and actually.

The total imports (Diagr. II.) into Canada have risen from $73,459,644 in 1868 to $129,074,268 in 1893; exports from $57,567,888 to $118,564,352; and the aggregate trade from $131,027,532 to $247,638,620. The volume of trade in 1893 was considerably in excess of any previous year since confederation. Values alone, however, do not give us the just measure of this increase; they are apt to mislead in comparing the statistics of the returns of the trade of one year with that of another. It is well known that during the last twenty years the prices of commodities everywhere have experienced an extraordinary decline. Basing their calculations upon the course of prices of forty-five of the principal commodities, the best German economists estimate the decline from 33⅓ to 40 per cent. during the period in question. Mr. Sauerbeck, taking the average prices ruling between 1867-77 at 100, shows the fall from that time to have continued almost without interruption, reaching in October of the present year 61·7, or 38·3 per cent. It is evident, therefore, that in order to maintain the position reached in previous years the volume of the trade exchanges must have been on a correspondingly larger scale. As an example, the average annual aggregate trade of Canada (Diagr. I.) for the period 1867-77 was $176,000,000, and for 1893, $247,000,000, showing an increase of only a little less than $71,000,000. At the prices ruling in the former period, and placing the decline at only 33⅓ per cent., there will appear a probable difference in favour of 1893 of not less than $153,000,000, or, say, an increase in round numbers of just under 90 per cent. in volume as compared with the former period.

It is possible to test this by the shipping returns. The average tonnage of vessels, sea-going and inland, which arrived at and departed from Canadian ports (exclusive of coasting vessels) for the two periods, were 11½ millions and 18½ millions respectively, or 65 per cent. increase, while the volume of increase of foreign trade by railway will easily account for the balance.

Another point to bear in mind when dealing with the trade exchanges of Canada is the value of the inter-provincial trade, representing the products of one province required by another. This movement of trade, prior to confederation, appeared as exports and imports in the returns of the separate North American colonies, just as a similar exchange appears to-day in the foreign trade statistics of each of the Australian colonies. This inter-provincial trade is estimated by our statistician at over $100,000,000—it was about $4,000,000 before confederation—and it may be taken as an evidence of the enormous internal development which political union and the policy of the Dominion Government in the matter of communications, rail and water, have called into existence.

There is a certain simplicity in the distribution of the external trade of the Dominion; Great Britain and the United States enjoying almost

a complete monopoly. The proportions for the returns of 1893, the latest year for which details are available, were as follows :—The United Kingdom took from Canada produce to the value of $64,080,493, or 54·05 per cent. of the total exports, and supplied $43,305,222, or 33·55 per cent. of the total imports; the United States took $43,923,010, or 37·05 per cent. of the exports, and supplied $58,221,976, or 47·97 per cent. of the imports. The two countries controlled, therefore, 86·31 per cent. of the total trade.

Thus, while this country takes a much larger proportion of the exports of Canada than do the United States, the imports are smaller from Great Britain than from the Republic. With regard to the Canadian statistics of the imports generally, I wish to remark here, parenthetically, that, on the lines of the system of valuation adopted by Great Britain with other countries, and for purposes of comparison, therefore, Canada's returns are much understated. Canada takes the value of her imports at the *port of shipment*; Great Britain, the value at the *port of entry*; and most of the self-governing colonies the value at the *port of shipment, plus a percentage of about* 10 *per cent.* On this basis, therefore, the value of the imports into Canada in 1893 should really stand at from nine to thirteen millions of dollars higher.

Canada's geographical position conduces to intimate trade exchanges with the United States. An examination, however, of the imports received from the two countries shows that there is little common ground of competition between the United Kingdom and the United States, in the Canadian market. Canada's position industrially, as against the United States, is assured by the policy of *incidental protection* in force since 1879. This circumstance tends to confine the imports of manufactured articles to those classes of goods which the highly-specialised industry of England is so well able to supply, and for which the steady development of the Dominion will continue to provide an expanding market. In evidence of this, I may remark that the imports entered for consumption from Great Britain have risen—exclusive of coin and bullion—from $30,870,000 in 1879, to $42,530,458 in 1893 : those from the United States have risen from $42,057,000 to $52,338,658 in the same period.

Dividing the Canadian imports into two classes of manufactured articles, and crude and partially manufactured products, such as sugar, tea, fruits, coal, steel rails, chemicals, etc., we find that 58 per cent. fall under the former class, and 42 per cent. under the latter. Now the receipts from England, tested by this classification, represent 52 per cent. of manufactured articles imported and 20 per cent. of all others. In textile fabrics and dress goods, which constitute the most important part of the imports from the United Kingdom, the position in Canada since 1888 has been maintained, while, as every one knows, in almost every other direction the disturbance of trade has caused considerable shrinkage in these exports from this country.

Coming to the United States, we find that fully one-half of their imports consisted of natural products, such as coal—mainly to the province of Ontario, which has no deposits of its own—of agricultural

produce, tobacco, raw wool and cotton, etc. If in addition we allow for manufactures of wood, iron, and leather, peculiar to the country, and for non-American articles, for which New York and Boston are *entrepôts* on our continent, the effective competition with Great Britain is reduced to insignificant limits.

Another view of the class and extent of the imports into Canada from the two countries may be obtained from the fact that 45 per cent. of the total amount of duty collected was derived from goods from Great Britain, and 36 per cent. from goods from the United States, this difference being accounted for by the fact that nearly 51 per cent. of the imports from the United States were free goods, principally raw material, while only 26 per cent. of the imports from Great Britain were on the free list.

I may remark here generally that Great Britain's policy of free imports during the last forty years has been dictated by her condition, circumstances, and resources, the effect of which when crystallised we call self-interest. Nobody, I imagine, considers these conditions will last for ever. They will vary and change, and demand corresponding modifications in the policy in which the enlightened self-interest of the day is expressed. It is impossible for this country to ignore the fact that all the great self-governing colonies have been drawn towards Protection by the same compulsion, viz. self-interest; and I take it the extraordinary development of the colonies shows that they have been the best judges of their own affairs. As you may know, I have a very strong belief that the not distant future will see a considerable change of policy both in this country and the colonies in regard to the development of intercolonial and Imperial trade, and that the change necessary to bring this about will not be all on the side of the colonies.

I have always refused to discuss the questions of Protection and Free Trade as matters of abstract principle in relation to the practical needs of Canada. I have been content to dwell on the fact that we have in Canada a certain population which is vastly exceeded by that of the great nation along our southern border, and that it is impossible to carry on the general affairs of Canada successfully without paying some regard to the close proximity and fiscal policy of that great Republic. The effect of a revenue tariff was tried in the years that immediately preceded the return of the present Government to power in 1879. In adopting then a policy of *incidental Protection*, we simply recognised the necessity of raising the necessary revenue which the development of the country called for, and of fostering Canadian industries. In arranging that policy we were thereby enabled, as you have seen, to give a decided advantage to British manufactures and products. It is quite true that Canada has greatly improved her industrial position of late years in a great many articles of common use which were previously imported. The following is a general comparative statement of our manufacturing industries from 1881 to 1891:—

	1881.	1891.	Variation.	
			Increase.	Per Cent.
Number of establishments,	49,923	75,768	25,845	51·8
Capital invested, . .	$165,302,623	$353,836,817	$188,534,194	114·0
Number of employés, .	254,935	367,865	112,930	44·43
Wages paid, . . .	$59,429,002	$99,762,441	$40,333,439	67·86
Cost of raw material, .	$179,918,593	$255,983,219	$76,064,626	42·3
Value of products, . .	$309,676,068	$475,445,705	$165,769,637	53·5

The development was largest in Ontario and Quebec, where the output per head of population rose from $82 and $77 in 1881 to $113 and $102 in 1891, respectively, or 33·6 and 38·2 per cent.

That the United Kingdom, notwithstanding, should have steadily improved her position as to exports to Canada from 1879 to 1893, shows that our wants in the classes of goods she supplies are growing, and that they are outside the scope of our industries as at present established.

In the new tariff, which was passed through the Dominion Parliament last July, Canada has given a further proof of her desire to discriminate in favour of British imports. It will be found that the reductions made are, to a great extent, in articles—especially textile and metal manufactures—largely the products of British industry. In the total trade for the fiscal year ended June 30th last it is true that the total imports into Canada have fallen about 7 per cent. English imports have shrunk, no doubt, but this may be attributed to the paralysis of business generally in the United States, as well as to the then impending changes in our tariff. It is expected that the present fiscal year will show a recovery.

During the period in question large reductions in taxation have been made; the amount raised by Customs having diminished from $5·23 per head of population in 1883, to $4·27 in 1893, or roughly, $1 per head of population—which is at present five millions. One of the most popular and equitable remissions has been the duty on sugar. We have long possessed free tea. Canada, therefore, has set the example of giving her population "the free breakfast-table," which is at present denied to the people of this country. Coming to the exports of Canada, the greatest advances have been made in all the staple products. Timber, Canada's sheet-anchor, has held its own, notwithstanding the depression in the world's markets. One of the chief changes that has occurred in regard to that article has been the steady decline in square timber, and the increasing quantity of sawn or manufactured wood. An enormous development has occurred in the exports of animals and their products. Perhaps I should here refer to the development of the cheese industry, under the factory system, which is now introduced throughout Canada. The export of this article within the last twenty years has steadily risen from 24,050,000 lbs. in 1873 to 133,946,000 lbs. in 1893. The position is solely due to the excellence of the Canadian article, which is rapidly supplanting American cheese in the British market. American exports stood in 1893 at 81,000,000 lbs., or over 10,000,000 lbs. below the return

for 1873, after having touched 147,000,000 lbs. in 1881. As practically the whole of these exports from the United States, as well as from Canada, come here, you will be able to form some idea of the success which has attended our efforts to capture this market. At the Chicago Exhibition last year the superiority of Canadian cheese was fully shown in the two competitions that took place. With 686 entries Canada took 608 prizes, as against the 587 exhibits and 54 prizes of the United States.

The manufacture of butter, especially of winter butter, is being rapidly organised in the same way; and I have it on the authority of the Government Dairy Commissioner that within five years' time Canada's butter exports will equal those of cheese. I should explain that the Government have done a great deal to promote the dairy industry by sending travelling dairies, with competent instructors and lecturers, throughout the different provinces, for the practical demonstration of the best methods of manufacture, packing, and marketing.

The export cattle trade of Canada is again another instance of the success which has attended the development of a new industry. The trade was practically started in 1873, and reached its highest point in 1891, when cattle to the number of 107,000, valued at $8\frac{3}{4}$ millions of dollars, were exported to this country alone. Towards the end of 1892, however, the expansion of the trade received a check by the revocation of the privilege, enjoyed up to that time by Canada, of sending her cattle alive into this country, owing to the suspicion of pleuro-pneumonia among a few of the Canadian cattle landed here. It is only fair to add that this has never been established. The highest experts who were called in were unable to agree as to the precise nature of the disease, and although the very strictest investigation has been conducted by the Dominion Government among Canadian herds, from that day to this, no single case of pleuro-pneumonia has yet been detected. Contagious pleuro-pneumonia, I need not tell you, is a disease which cannot be concealed; and in such an extensive cattle-raising country as Canada the ravages it would cause, if it existed, would attract attention far and wide. Our agricultural exports maintained the high average reached in the previous year, which was several millions of dollars above that of 1891, notwithstanding the serious decline in prices. The development of the Canadian flour trade in the English market was a pleasing feature, and, in view of the excellent quality of our wheat, it should ultimately take precedence of the American article. Hay imports into this country were on a large scale, owing to the drought of last year, and Canadian hay is confidently stated to have now obtained a permanent footing here. The exports of Canada for the year ending June 1894—$117,500,000 — are the largest of any year since confederation, except those of 1893. The decline, however, is less than one per cent. The growing extent of Canada's trade exchanges may be estimated by the clearance of sea-going and inland shipping, which in 1879 stood at 11,646,812 tons, against 18,539,534 tons in 1893. Canada, moreover, still stands fifth in the list of ship-owning countries, with a tonnage of 1,054,217 tons, occupying a middle position between Germany and France. The shipping on the Canadian Register is valued at fifty million dollars.

One of the most encouraging and significant facts during the last four years has been the stability of Canada's trade. There is hardly a country that can show the steady progress made by Canada in the face of commercial disturbance, the breakdown of credit, and financial depression of the severest kind in other countries. Canada has not only survived, but she has forgotten, the M'Kinley tariff of 1891. This measure, it was expected, would cripple her commercially in so far as United States trade was concerned, and I have told you already how large that is. Events proved the M'Kinley tariff legislation to be a blessing in disguise. Anticipating the worst, Canadians set to work to find new markets for the threatened exports which were to be thrown on their hands. The Government and its agents abroad co-operated to their utmost. The result of this foresight and activity was that Canada vastly increased her exports to the British market, and opened up fresh markets in other countries hitherto untried, and at the same time actually increased her total exports to the United States. That position has been increasingly maintained to the present hour.

On the heels of the M'Kinley tariff came the financial crisis of 1892-93, the difficulties of Australian financial institutions, and the impairment of credit, accompanied by great stringency of money in the United States. Canada remained comparatively unaffected by these misfortunes. Her aggregate foreign trade of 1892 exceeded that of 1891 by $22,984,000, and in 1893 she again still further improved her position by $6,280,000 more. The export trade for 1893-94, as already stated, almost maintained the splendid record of 1893, and this, let it be stated, notwithstanding the fall in prices which had taken place, showing, in spite of everything, the continued demand for Canadian produce abroad.

Down to the present time, there has been only one small bank failure in Canada, and even that was not due to financial depression. In the United States, over two hundred national banks closed their doors in 1893; or, including State and private banks, savings banks, and loan societies, over six hundred financial institutions succumbed. Writing in the *Forum* early in the present year, Mr. D. A. Wells, the well-known American economist, says:—"In the Dominion of Canada, separated territorially from us on the north by an imaginary line, there has been no panic, no unusual demand for money, no stoppage of industries, no restriction of trade, no increased rates of interest; in short, nothing beyond the ordinary course of events, except so far as these events may have been influenced by contiguity to what may be termed a financial cyclone, whose pathway of destruction was contiguous to, but not within, Canadian territory."

Canada's position has undoubtedly been improved by the prudence of her commercial men, and the soundness of her banking system. Perhaps the greatest factor in the situation has been the circumstance, as we were recently told by the President of the Bank of British North America, that "Canada banks on her own capital, and does not borrow money, as so many colonial banks do, on deposit, which generally falls to be repaid at most inconvenient times." In this connection it may be appositely mentioned that the deposits of the people in the various banks in Canada

(Diagr. IV.) have risen from $85,918,583 in 1868 to $229,450,216 in 1893. The strong financial position, generally, of the Canadian banks may be inferred from the Government returns for June last, which show that their reserve was equal to over 43 per cent. of their paid-up capital.

Canada's national credit has never stood higher than at the present time. This position is best illustrated by the 3 per cent. loan for £2,250,000, recently put upon the London market, which was subscribed for more than five times over, the average price realised being £97, 9s. 2d. The stock has now practically reached par.

The commercial value of the fisheries of Canada was nearly $21,000,000 in 1893, irrespective of all the fish consumed by the Indians, estimated at another two millions of dollars. The industry affords employment to some 68,000 men.

The attention devoted to mining enterprise in Canada is on the increase. The total output, which was valued at $12,000,000 in 1886, reached $19,350,712 in 1893. The exports for the latter year amounted to $5,881,000.

Up to the present time, the coal measures have received the greatest attention. These occur most extensively on the Atlantic coast, in the western prairie regions, and on the Pacific coast. Nova Scotia furnishes two-thirds of the present total output. It is expected, moreover, that the export of Canadian coal from that province to the manufacturing centres in the New England States will shortly assume large proportions. The industrial existence of that section of the United States is absolutely dependent on cheap fuel, and Nova Scotia has the best and nearest sources of supply. Iron ore, of every variety and richness suitable for steel, is present in the greatest abundance in Nova Scotia, as well as in Quebec and Ontario. And, apart from the growth and prospects of the iron industry of Canada, I should like to direct the attention of English and Scotch ironmasters to the advantage of these deposits as an alternative source of supply to Spanish ores, which, it seems, are within a measurable distance of exhaustion. Their occurrence in Nova Scotia, on or within easy reach of tide water, ensures cheap transportation all the year round. Probably the greatest mineral discovery of recent years has been the nickel ore deposits at Sudbury, in Western Ontario. They are the largest known, and promise to affect profoundly the steel industry of the world in the immediate future. The United States Government take a large portion of the present output for the armour-plates of their new war-ships now under construction.

The colonisation of the Dominion is naturally the most important matter that can engage the attention of Canadians, as upon it the continued progress of the country ultimately depends. Canada's prairie regions offer, probably, the greatest area of land still available for the settlement of the races from Northern, Central, and Western Europe. The radiation of heat from the immense area of arid country, possessing an average elevation of 6000 feet, to the south of the boundary line, has an important bearing on the climatic conditions of the Canadian North-west; and an extent of country, estimated at 700,000 square miles south of 60° N. lat., is thereby rendered suitable for the production of all

crops grown in the United Kingdom. The moisture-laiden winds from the Gulf of Mexico and the Gulf of California are drawn towards the north, and carrying their fertilising burden over the heated plateau of the "Great American Desert," they deposit it on the lower plains, in Canadian territory, in the form of the summer rains which cause such astonishing growth in June and July. Another source of climatic amelioration is to be found in the prevailing Chinook, or west winds, blowing in from the Pacific, warmed by the Japanese current which sets towards the Pacific coast in high latitudes and flows along the coast-line of British Columbia.

The combined influence of these conditions is seen in the rapid sweep to the north-west described by the summer isothermal lines of 60° and 65° Fahr., east of Winnipeg, the effect of which is to push the limit of possible wheat-growing beyond the Peace River country up to Fort Simpson, in 61° N. lat., on the Mackenzie River, a point fully 1000 miles north of Toronto. The organised portion of this western territory (comprising Manitoba, Assiniboia, Alberta, and Saskatchewan) presents roughly the appearance of a large parallelogram, and occupies its southern area. It contains some 360,000 square miles, or about 250,000,000 acres, of which only the merest fringe has yet been occupied. The following figures will give, however, an idea of the progress that has been made in this section in the ten years, 1881 to 1891:—

	1881.	1891.
Population,	87,775	211,996
Railway Mileage,	150	2,150
Grain Crop, in Bushels,	2,617,637	55,000,000
Number of Elevators,	...	100
Elevator capacity, in Bushels,	...	8,000,000[1]
Cattle,	75,000	500,000
Number of Post Offices,	153	600
Number of Schools,	100	800

Emigration to, and settlement in, this western part of Canada is no longer the arduous undertaking it once was, when the first colony was planted by Lord Selkirk in 1812. On that occasion, and subsequently, the settlers arrived by way of Hudson Bay, and Fort York on the Nelson River. Now railways penetrating in every direction render enormous areas easily accessible for free selection, and secure the economical transport of produce. The soil is of the richest description, and, with perseverance and patience, there is unquestionably an immediate livelihood, with the prospect of a competency in the near future, before every settler.

The present and future of the Canadian North-west is not a question which the price of wheat is going to decide.

Wheat, of course, must always be the staple of that country, and long after the United States have ceased to grow it for export. The centre of wheat production on the North American Continent is shifting over to the north-west. It was south and east of Chicago at one time, and is now close to the boundary line. The most reliable climatologists state that three-fourths of the best area for wheat lie north of the forty-ninth

[1] In 1893, 11,500,000 bushels.

parallel, that is, in Canadian territory. The conditions suitable for the growth of wheat favour a wide range of products, and the prudent farmer accordingly will vary his wheat with cattle-raising, pig-breeding, dairying, poultry and eggs, and the coarser grains. This is being recognised already ; and although in the present year the prices realised for wheat have been discouraging, the farmer has largely recouped himself by the relatively high prices of other products. Above all, we must remember that the settler on his farm is practically self-contained. Owning his land, he pays no rent, his taxes are merely nominal, and, unless farming on borrowed capital, he will make money, or what is the same thing, add its equivalent to the stocking, equipment, and improvement of his farm. In times of the greatest depression he will always be able to make a living.

Emigration from the United Kingdom, and Europe generally, has slackened during the present year owing to obvious causes. But with the improvement now noticeable in the general situation, the flow will be resumed in increased volume, and Canada will obtain a larger share of emigration as time goes on.

One interesting fact in connection with emigration to Canada during the last year or two is the movement towards the north-west that is now proceeding from the northern tier of States, especially from North and South Dakota, Nebraska, Minnesota, and Michigan. Delegations of farmers from these States recently visited various points of the country, and large numbers have since taken up homesteads in the Saskatchewan and Alberta districts. The fact is that the best land available for free grants has passed out of the hands of the Government of the United States, whereas there is an unlimited extent of splendid land available in Canada, possessing climatic conditions superior to those existing in the States in question, and well served by railways in every direction. There is every reason to believe that Canada will find in the future a fruitful source of immigration in the neighbouring Republic.

The present year, I venture to say, will be historically memorable for at least two events of economic and political importance which have taken place. The Canadian Parliament ratified, on July 19th, the treaty which the Marquis of Dufferin and Ava and myself, as plenipotentiaries for Great Britain, had the honour of negotiating in Paris for the extension of trade between France and Canada. The competency of Canada to negotiate a treaty was conceded in 1884, when, at the request of the Canadian Government, I was appointed a plenipotentiary, in conjunction with Her Majesty's Ambassador at Madrid, to negotiate a treaty for the extension of trade between the Spanish Antilles and Canada, and the present treaty with France is the first successful result of the kind that has been achieved by any British Colony.

It is not too much to say that this event marks a new era in the constitutional history of the self-governing dependencies of the British Empire, and sets the seal upon the powers given to Canada in the ordering of her external trade relations. It recognises, in the most emphatic manner, the growing importance of the colonies in the hegemony of the Empire, and is a sign of the process of re-adjustment in the attitude of the Mother-country towards her adult offspring now in progress.

The second, and the greater event, has been the meeting of the Imperial and Intercolonial Conference at Ottawa, to discuss and elaborate measures for the development and increase of trade within the Empire, and intercommunication by means of fast lines of steamships and by cables. It is not difficult to recognise the influence which Canada's geographical position has had in this matter. The Governor-General of Canada, the Earl of Aberdeen, in his address to the Conference, emphasised that point, when referring to the selection of Ottawa as the scene of the meeting, in the following terms :—"That such should have been the arrangement is certainly both natural and appropriate, not only because of the fact that the idea suggested of holding the Conference emanated from here, but also because of the position, geographical and otherwise, which Canada occupies in the British Empire; and not only so, but because of the use that has been made by the people of Canada of that position, both in developing the resources of Canada itself, and in carrying out enterprises of a vast and gigantic character which cannot fail to be of the deepest and most permanent interest and importance to the Empire as a whole."

Lord Rosebery sent the following message to the President of the Conference on the 3rd of June :—"I am anxious to express to you as the President the sympathy and interest with which I am watching the proceedings of the Conference, which should be of such happy augury for the future of the Empire." On the 5th of August the Queen's Speech in proroguing Parliament thus referred to the proceedings of the Conference :—"A Conference was held at Ottawa in the month of June last, at which representatives of the Imperial Government, the Dominion of Canada, the Cape, and the Australasian Colonies met to consider questions relating to intercolonial tariffs and communication. I have learned with satisfaction that the proceedings of the Conference were of a character calculated to strengthen the union of the colonies concerned, both among themselves and with the Mother-country." The Conference unanimously asked the Imperial Government to take the measures necessary to remove the obstructions that now interfere with preferential trade between the colonies, and between themselves and the Mother-country. The same unanimity characterised their resolutions in favour of steamship communications between the United Kingdom and Australia *viâ* Canada, and the construction of a Pacific cable from Canada to Australia.

In view of these facts, who can doubt that this Conference marks an important epoch in the development of the British Empire, which will result in a great expansion of Intercolonial and Imperial trade, and render the union between the Colonies and the Mother-country still closer and more indissoluble?

MR. CONWAY IN THE HIMALAYAS.[1]

THE Karakoram, or Mustagh range, is intermediate between the Hindu-Kush and Kuen Luen systems, and forms the watershed between the Upper Indus and the Oxus. The northernmost angle of this noble mountain barrier of India, unparalleled among the mountain chains of the world for the number and height of its peaks and the extent of its glaciers, was the scene of Mr. Conway's explorations in the summer of 1892.

His object was to observe the glaciers from a scientific mountaineering point of view, to compare the conditions of snow and ice phenomena with those of the Swiss Alps, and to attempt the ascent of a peak or two. His companions were Mr. M'Cormick, a talented artist; Mattias Zurbriggen, an experienced Swiss guide; Lieut. the Hon. C. G. Bruce of the 5th Gurkhas; Messrs. Eckenstein and Roudebush. Four Gurkhas of the same regiment contributed by their admirable service to the success of the expedition. This book is a record of their doings, written at the time, before the impressions of the scenery and the incidents of each day had faded from their minds. It brings before the reader, in a series of vivid pictures, the wild and rugged nature of the country, with its horrible stony valleys where a burning sun makes life almost unendurable; the magnificent scenery of the higher regions, where storms and ice-streams are carving the face of rock precipices and softening the outlines of hill and valley; and, lastly, those giant mountains which tower aloft in solemn grandeur over the desolate world of ice and snow.

It was through such scenery that Mr. Conway and his party advanced up the Hispar pass and along the whole length of the Biafo and Baltoro glaciers to the snow-covered slopes at the foot of the great mountains. Practised mountaineer though he was, Mr. Conway found the walking far worse than any he had yet experienced. The glaciers were much longer, wider, and more crevassed than those of Europe, while the rock *débris* was out of all proportion greater. It was a constant struggle over stone-covered mounds, monotonous and fatiguing to travel over. Neither was there any prospect, at the end of the day's journey, of a warm, comfortable hotel to rest in. The most that could be expected was the shelter of a miserable tent where a few hours of sleep, often courted in vain, might enable the weary explorers to resume their journey. In spite of all these untoward conditions, and notwithstanding the constant bad weather, so depressing to mountaineers, Mr. Conway and his party kept up their spirits. When the sun dispersed the clouds he was ready to set up the plane-table and take a round of angles; now and again he would start off to climb a ridge whence he could get a more extensive view. On one such occasion, accompanied by Bruce and Zurbriggen, Mr. Conway first caught sight of a rounded mountain mass, to which he gave the name of Golden Throne. This, the most brilliant of all the mountains seen, became the chief object of their desires. With one consent they cried

[1] *Climbing and Exploration in the Karakoram Himalayas.* By William Martin Conway, M.A., F.S.A., F.R.G.S., etc. With 300 Illustrations by A. D. M'Cormick, and a Map. London: T. Fisher Unwin, 1894. *Price* 31*s.* 6*d.*

out, "That is the peak for us; we will go that way and no other." Mountaineering, however, is full of disappointments, though not without its rewards, and the Golden Throne remained unascended. By means of the photographic camera, however, and Mr. M'Cormick's talented brush, its outlines, and those of its other giant companions, K 2, Gusherbrum and Masherbrum, were accurately defined. It was one of the chief objects of the expedition to photograph the great mountain K 2, the second highest in the world; and Mr. Conway determined that, if he remained on the glacier till winter, he would not leave this part of his programme unaccomplished. They spent five nights on the moraine at the junction of Godwin-Austen and Baltoro glaciers, while the snow fell and dense clouds obscured the distant view. The difficulties of arranging for supplies of food and fuel for so large a party at such an elevation (15,870 feet) were very great. But Mr. Conway's powers of organisation were equal to the emergency. The twenty coolies were divided into relief parties, and were kept constantly carrying loads from a lower station, where fuel could be collected. So successful were these arrangements, that the *menu* for each day comprised hot fresh herrings for breakfast; chops and a sweet omelette for lunch; soup, a joint, and scrambled eggs for dinner—not a contemptible fare for men living beyond the limits of human habitation, where the only natural productions were ice and snow, and hardly a trace of animal and vegetable life could be seen for miles around. Their tents were pitched on broken stones overlying the ice; and here, huddled together, four men in a seven-foot tent, they waited patiently. Meanwhile, Mr. Conway deduced from his observations the relative and apparent height of the principal mountains. K 2 was found to be 27,750 feet, and Golden Throne 23,600 feet. These figures, dependent on barometrical measurements at their camp, are 500 feet below those ascertained by the Great Trigonometrical Survey of India for K 2 (28,250).

At length, on August 18, the weather cleared sufficiently to disclose the forms of the mountains and enable the party once more to start upwards. The sun shone out with extraordinary power and brilliancy, raising the temperature suddenly, not, as in lower regions, turning the newly fallen snow into water or slush, "but drying it up into the thirsty air." Advancing for some distance over the moraine, they at length came to snow-fields and mounds of ice uncovered by stones, of a formation peculiar to the Baltoro glacier. The descriptions given of this glacier and the climb to the summit of Pioneer peak (chaps. xxii. and xxiii.) are exceptionally interesting, for they cover a good deal of new ground. Colonel Godwin-Austen in 1861 surveyed the main features of this icy region, but he did not attempt any difficult mountaineering work, for which, indeed, he was not equipped. Captain Younghusband in 1887 felt his way across the disused Mustagh pass, coming from the north and descending to Askole. Mr. Conway added to and completed Godwin-Austen's survey, besides making a number of new observations specially valuable from a mountaineer's point of view, and also of wide general interest. His collections of the flora along his route are a distinct gain to botanical science, while his notes on the

effects of high altitudes and variations of temperature on the human organism are very valuable.

There can be no doubt but that in climbing Pioneer peak (23,000 feet), an outlier of Golden Throne, Mr. Conway and his companions accomplished all that men could do, every step of the last part of the ascent having to be cut with the axe, and all precautions being taken to avoid disaster. Zurbriggen himself declared that not another step could he cut; and all of the party, weakened as they were by the continued strain of the last three weeks, recognised that the utmost limit had been reached, and that henceforward nothing remained for them but "downwards and homewards."

We are compelled to pass over much that is interesting in this book: the description of Kashmir, with its gardens, ruined temples, and lovely scenery contrasting with the dirt and squalor of its capital; the march to Gilgit, and thence up the Hunza valley to Nagyr and Baltit; and, lastly, the visit to Leh and the Lamasery of Himis. We lay down this book with the conviction that its author has laid the British public under a deep debt of gratitude; and we hope that other explorers will be found to carry on such work in the same spirit and with the qualifications possessed by Mr. Conway.

E. D. Morgan.

OBITUARY: 1894.

By J. W. M'Crindle, M.A., M.R.A.S.

Lieutenant-Colonel Alfred Burdon Ellis, C.B.—This distinguished officer, who was the author of several valuable works on African geography and ethnology, died of fever in the island of Teneriffe, on the 5th of March last, at the early age of 42. His name was at the time prominently before the public. He had conducted with eminent success the short but arduous campaign against the Sofas, and the official despatches in which he described its incidents had all appeared in the columns of the *Times* just before he was cut off. He was the only surviving son of Lieutenant-General Sir S. Burdon Ellis, K.C.B. Born in 1852, he entered the army at the age of 20, and after a short term of service in the West Indies was transferred to Africa, where during the remainder of his career he rendered important services both as a soldier and as an administrator. He took part in the Ashanti War in 1873-4, also in the operations against the Awama, and in the Zulu War. In 1892 he commanded the expeditions to Tambi and to Toniataba, receiving for the latter the C.B. and the medal with clasps. He held various civil as well as military commands along the West Coast, chiefly on the Gold Coast and in Sierra Leone.

Colonel Ellis, amidst the discharge of his official duties, found time to study the languages and ethnic characteristics of the Guinea tribes; and the works in which he has embodied the results of his researches are

of high value and authority. His *History of the Gold Coast*, which appeared in 1893, is a thoroughgoing history of the Gold Coast from the earliest times to the present day, and contains a full account of the Ashanti War of 1873-4.

Dr. Hendrik Johannes Rink.—Dr. Rink, who for the last forty years of his life was the supreme authority on all manner of questions relating to Greenland, died at Christiania on the 15th of December 1893. He was born in Copenhagen in 1819, and was the son of a Kiel merchant. After having studied with distinction at Kiel University, he went to that of Copenhagen, where he graduated as a Doctor of Philosophy. He accompanied as a naturalist the Danish expedition for sailing round the world, which had for one of its objects to make a fresh attempt to colonise the Nicobar islands. This enterprise failed, but Dr. Rink was able to complete a survey of these islands. His health, however, had broken down, and he returned to Denmark, where in 1847 he published an account of his researches in two separate works. In the following year he went to Greenland, and for the next seven years was engaged in exploring the whole of its outer coasts and fiords, his only companions being the Eskimo, with whose language and traditions he took the opportunity of making himself thoroughly familiar. The results of his investigations he made known in occasional short papers, and chiefly in his memoir entitled *De Danske Handeldistricter in Nordgrönland*, which was published by the Academy of Sciences. From 1855 to 1868 he held the appointment of Royal Inspector of South Greenland, a post in which he did much to encourage education and promote the general well-being of the natives. On the death of Herr Olrik, the Inspector of North Greenland, in 1871, Dr. Rink's services were rewarded by his appointment as Director of the Royal Greenland Board of Trade, the department which controls the commerce and other affairs of the Arctic possessions of Denmark. His headquarters were at Copenhagen during his tenure of this office, which lasted till 1881, when the state of his health compelled him to seek retirement. On resigning he retired to Christiania, where his only daughter resided. He published other works than those already mentioned, among which may be instanced his *Eskimoiske Eventyr og Sagn*, which appeared in 1866, and nine years afterwards re-appeared in an English version with the title *Tales and Traditions of the Eskimo*; *Danish Greenland*; and a treatise called *The Eskimo Tribes*, in which he expounded his views of the origin and migration of the Arctic peoples. While he resided in Christiania his house was a great resort of all who were interested in the Arctic regions, and his influence had no small share in re-kindling that zeal for Arctic exploration which has of late led to the despatch of so many expeditions in quest of the North Pole.

Peter Leopold von Schrenck, celebrated as the explorer of the lands of the Amur, died on the 20th of January last in St. Petersburg. He was born in 1826 in the Russian government of Kharkof, and on the completion of his school course entered the University of Moscow,

where he devoted himself to the study of natural science, and was rewarded with the degree of Master of Philosophy. In 1850 he went to Berlin, and there, under the influence of the famous Karl Ritter, zealously prosecuted the study of geography. In 1852 he obtained the degree of Doctor of Philosophy from the University of Königsberg, and published his work entitled *Ideen zu einer Hydrographie der Landseen mit besonderer Rücksicht auf die Seen der Alpen.* He held for a short time the post of Professor of Geography in the University of Dorpat, and then proceeded to St. Petersburg, where he was admitted to the privileges of an adjunct of the Imperial Academy of the Sciences. By this body he was sent out to explore scientifically the regions through which the Amur passes, and was allowed for the purpose the services of two assistants, one for drawing and the other for preparing specimens. He sailed for the scene of action in August 1853. The frigate which carried him having been detained for several weeks at Rio Janeiro, he turned the time to account by making an excursion into the Brazilian primeval forest. A second detention occurred at Callao, the port of Lima, whence he made an excursion to the graves in which the Incas entombed their dead. Some of these he excavated, and by rifling their contents made a fine collection of antiquities. From Callao he sailed direct to Kamtchatka, and, arriving at Petropaulofsk, there left the frigate. He then sailed through the Sea of Okhotsk to the mouth of the Amur. He published afterwards a work in which he recorded his observations on the currents of that sea, which he had studied during the passage. He spent two years and a half (1854-1856) in exploring the Amur regions, and then returned to St. Petersburg through Siberia and Russia. The working up of his materials was a laborious task, and occupied him for many years. Unfortunately the great work in which he was giving to the world the result of his researches had not been completed when he died. The parts which have been published are devoted chiefly to zoology and a description of the tribes in the neighbourhood of the Amur. The title of the work is *Reisen und Forschungen im Amurlande.* Its merits are of the highest order. The author is praised for the lucidity of his style, the depth of his thoughts, and the force of the reasoning by which he establishes his conclusions. In St. Petersburg he rendered several important services towards the furtherance of science, among others the creation of the Anthropological-Ethnographical Museum of the Academy of the Sciences. The Academy rewarded him with admission to its membership, and the Government by appointing him, in 1873, a Councillor of State, with the title of Excellency, and afterwards by promoting him, in 1888, to be a Privy Councillor.

Admiral Sir Edward Inglefield, K.C.B.—Sir E. Inglefield, who rendered important services to geography by several voyages which he made to the Arctic regions, died in London on the 5th of September last. He was born at Cheltenham in 1820, and was the son of an admiral. He was educated at the Royal Naval College, Portsmouth, and, having entered the navy, saw service in the Levant, in the Malay Archipelago, and off the coast of South America. In 1852 he sailed in a yacht to the

Arctic seas in quest of Sir John Franklin. In this voyage he discovered that within Smith's Sound there existed open water, and on returning to this country was awarded the gold medal of the Royal Geographical Society. In 1853 he was sent out in command of three vessels for the relief of the Belcher expedition in Wellington Channel, and in the following year was again sent out for the same purpose. He succeeded in rescuing the crews of several of the deserted vessels which belonged to the Belcher expedition, and brought them back with him to England. He afterwards took part in the operations connected with the siege of Sebastopol. In 1869 he was promoted to be a flag-officer, in 1877 was knighted, and in 1887 was made a K.C.B. He wrote papers on naval and scientific subjects, and also a book called *A Summer Search for Sir John Franklin.*

Captain Verney Lovett Cameron.—The sad news that Captain Cameron, who had escaped so many perils in his well-known adventurous journey through Africa, had been killed by falling from his horse on his way home from the hunting-field, was received with painful regret in all parts of the country. This event occurred at Leighton Buzzard on Easter Monday, the 26th of March last. This great traveller was the son of the late Rev. J. H. L. Cameron, vicar of Shoreham, and was born near Weymouth in 1844. Having entered the Royal Navy in 1857, he served in the Mediterranean, the West Indies, and the Red Sea, and distinguished himself in the Abyssinian campaign of 1868. In 1873 he left England in charge of the second expedition which the Royal Geographical Society despatched to Africa to find and succour Livingstone. On March 18 the expedition left Zanzibar, and on August 5 arrived at Unyanyemba. During a halt which was made at this station, the servants of Dr. Livingstone brought to it the dead body of their master. Two members of the expedition, Lieutenant Murphy and Dr. Dillon, were sent with the body to the coast, while Cameron himself resolved to proceed westward into the interior. On February 21, 1874, he reached Ujiji on Lake Tanganyika, where he found some of Livingstone's papers and one of his maps. He fixed with precision the position of Ujiji, explored the southern half of the lake, and corrected the accepted estimate of its altitude. He discovered the river Lukuga, which issues from the lake, and which he held to be an affluent of the Lualaba, a river which, as shown by Stanley, is the upper course of the Congo. On May 20 he left Ujiji, proceeding westward to reach the Atlantic Ocean, and in August arrived at Nyangwe, a station on the Lualaba. He was anxious to advance by this river, but, finding it impossible to procure boats for the purpose, he turned south-westward, and, having reached Kilemba, the chief town of Urua, in October 1874, remained there till about the end of February of the year following. He employed this interval in making excursions, which enabled him to fill in not a few blanks in the map of Africa. Having resumed his march, he passed through Bihé, and on the 7th of November reached Katombela, on the Atlantic, a place situated to the north of Benguela. He was the first European who crossed Tropical Africa from east to west. On his return home he received

various honours—the gold medals both of the London and of the Paris Geographical Societies, the order of C.B., the degree of D.C.L. from Oxford, and the rank of Commander from the Admiralty. In 1877 he published a narrative of his travels, under the title of *Across Africa*.

In the following year he started on a tour through Asiatic Turkey and Persia, and after his return published his work, entitled *Our Future Highway*, in which he advocated the construction of a railway from the Mediterranean to Karachi at the mouth of the Indus. In 1882 he joined Sir Richard Burton in an expedition into the interior of Guinea to search for gold. Gold was found, but not in sufficient quantity to pay expenses. The enterprise, however, bore fruit in the shape of some interesting contributions to Natural History, besides the establishment of the fact that a stone age had at one time existed on the Gold Coast.

Captain Cameron was the author of several works besides those already mentioned, as, for instance, *The Cruise of the Black Prince Privateer*, *The Adventures of Herbert Massey in Eastern Africa*, and a translation of a work on *Steam Tactics*. In his later years he was interested in several companies which had been formed for developing the resources and promoting the work of civilisation in the central parts of Africa.

Richard Buchta.—A short tribute is due in these pages to the memory of this distinguished Austrian painter, on account of his explorations in the Eastern Soudan, and of the incomparable skill with which, whether by means of camera, or pencil, or brush, he represented the scenery of the country and the persons of its inhabitants. He was born in 1845, at Radlof, a town in Galicia. He went to the Soudan in the days while it was still a dependency of Egypt, and he there associated with General Gordon, Schweinfurth, and Emin Pasha. Having an intimate knowledge of Egypt and its political relations, Buchta published in 1884 a work entitled *Der Sudán und der Mahdi*, and this was followed by another in 1888 entitled *Der Sudán unter ägyptischer Herrschaft*. Of the artistic works which he published, the greatest is held to be his costly *Album of the Human Types of the Upper Nile*. He was a modest, good-hearted man, and allowed others to deck themselves in his plumage, being well aware that the imposture would be easily detected. In Vienna he had to labour hard to keep himself from want, and had little, if any, intercourse with the geographical world. This caused him some bitterness. On the occasion, however, of the twenty-fifth anniversary of the Imperial Royal Geographical Society, the Emperor conferred upon him the good service cross with the crown. He died in Vienna on the 27th of July last from an apoplectic stroke.

The Right Honourable Sir Henry Austen Layard, G.C.B.—Sir Henry Layard, who made his name of world-wide celebrity by his discovery and exploration of the ruins of ancient Nineveh, died in London on the 5th of July last. He was born in Paris in 1817. His father was an Englishman—the son of Dr. Layard, Dean of Bristol—and his mother was a Spaniard. He was educated in Italy, where he acquired a taste for art. In 1833 he went to London to qualify himself for the bar, but,

finding the study of law too sedentary an occupation, he abandoned it for travelling. Accordingly, in July 1839 he left London, and after travelling in Central Europe reached Constantinople by way of Albania and Rumelia. Thence he passed over into Asia, where he wandered about for several years, first in Palestine and Syria, and afterwards in Ispahan, Central Persia, Susiana, and Turkish Arabia. It was a rough life he led, and full of the most romantic and perilous adventures. These he has described in a work which appeared long afterwards (1887), under the title *Early Adventures in Persia, Susiana, and Babylonia.* The work is charmingly written, and has taken a very high place in the literature of travel. In 1842 Layard returned to Constantinople bearing despatches from the British consul at Baghdad to Sir Stratford Canning, then the British Ambassador at the Porte. This great diplomatist, who to his other gifts added a keen insight into character, very soon discerned that his visitor was a man of no ordinary capacity, and well qualified, by his intimate knowledge of the Oriental races and their languages, both to advise him in framing his policy and to assist him in carrying it out. He accordingly availed himself of his services, which he wished to recognise by the offer of an *attaché*-ship on his staff. As the Foreign Office did not, however, sanction this proposal, he procured for Layard, in 1845, the permission of the Turkish Government to carry out the exploration of ancient Nineveh in accordance with plans which had been previously sketched by Layard himself. Sir Stratford also generously supplied him, mainly from his own private resources, with the necessary funds. In the following year Layard was authorised to export the sculptures which he had disentombed; and these, after a long delay, and in a more or less damaged condition, reached London, and were deposited in the British Museum. He returned to Europe in 1847, and found that his wonderful discoveries had raised him to the height of fame throughout the scientific world. Oxford at once recognised his services by conferring upon him the honorary degree of D.C.L.; and in 1849 he was appointed by the Foreign Office paid *attaché* at Constantinople to enable him to prosecute still further his researches in the valley of the Tigris. Parliament made him a grant of £3000 for the purposes of this second expedition, the labours of which he brought to a conclusion in February 1852. In the following works he has described the nature and results of his exploring operations:—*Nineveh and its Remains; Nineveh and Babylon;* and *Discoveries in the Ruins of Nineveh and Babylon, with Travels in Armenia, Kurdistan, and the Desert.*

After his return to England from the East, Layard devoted the rest of his life chiefly to politics and diplomacy. He sat in Parliament as member for Aylesbury from 1852 to 1857, and afterwards as member for Southwark from 1860 to 1868, in which latter year he was re-elected, sworn as a Privy Councillor, and made First Commissioner of Works and Buildings. In 1869 he went to Madrid as Envoy-extraordinary, and in 1877 to Constantinople as Ambassador-extraordinary to the Sultan. In the following year he received the Grand Cross of the Bath. In 1880 he retired into private life, and selected Venice as his place of residence, and there employed his leisure in the composition of works relating to art and literature.

Dr. Heinrich Brugsch Pasha.—This celebrated explorer in the domain of Egyptian antiquity died in Berlin on the 9th of September last, after a painful and lingering illness. He was born in that city in 1827, and was the son of a commander of the bodyguard. Early in life, and under the influence of Alexander v. Humboldt, he turned his attention to Egyptian studies, and on their completion visited the museums of Paris, London, Leyden, and Turin. In 1853 he proceeded to Egypt, where the excavation of the Apis sepulchres, conducted by the famous French archæologist Mariette, presented him with excellent opportunities for the study of history and hieroglyphics. On returning next year to Berlin, he was appointed Conservator of the Egyptian Museum. From 1857 to 1858 we find him again in Egypt, and in 1860 in Persia, first as a member, and afterwards as head, of the Prussian embassy to the court of the Shah. His next appointment was that of consul in Cairo—a post which he held from 1864 to 1868, when he returned to Germany and became Professor of Egyptology in the University of Göttingen. Not long afterwards, however, he returned to Egypt, having been invited by the viceroy, Ismail Pasha, to undertake the conduct of the School of Egyptology which had been established in Cairo. On the downfall of Ismail, he returned once more to his native country, rewarded with the title of Pasha, conferred upon him by Ismail's successor. In 1884, along with Prince Frederick Charles of Prussia, he undertook a journey which in its scope comprised Egypt, Syria, Greece, and Italy. In the two following years he was again in Persia, being on the staff of the embassy sent by Prussia to the Persian court. On returning to Berlin, he gave prelections in the University; but in 1891, at the instance of the Government, he once more proceeded to Egypt, wherefrom he brought back with him no fewer than 3000 papyrus rolls. His life's work was now finished, for during his closing years he was frequently prostrated by painful attacks of the disease to which he finally succumbed. For the foregoing particulars we are indebted mainly to a memoir of the great Egyptologist written by Herr W. Wolkenhauer, and published in the *Globus* and *Deutsche Rundschau*. He sums up the achievements of his departed friend in the following terms: "Through his numerous works he has enriched the knowledge of the hieroglyphic monuments, he has firmly established the geography of ancient Egypt, and generally has extended, almost more than any other, the knowledge of the chronology, astronomy, and history of ancient Egypt." His principal works which relate to geography are: *Reiseberichte aus Ägypten; Reise der Königl. Preuss. Gesandtschaft nach Persien; Prinz Friedrich Karl im Morgenlande; Im Lande der Sonne; Geographische Inschriften altägyptischer Denkmäler; Dictionnaire géographique de l'ancienne Egypte*. His last great work, which he published at first in the *Vossische Zeitung*, was *Mein Leben und mein Wandern*. It was a work of high interest, and was very widely read.

Dutreuil de Rhins.—On the 6th of August last, news reached France that the celebrated explorer, Jules Dutreuil de Rhins, had been murdered in June of this year by Tibetans, when, after a long sojourn in Central Asia, he was preparing to bring back to Europe the fruit of his travels

and researches. He was born in Saint-Etienne in 1846, and, having entered the French naval service, attained, towards the end of 1870, the rank of captain. In 1876 he was sent to Annam, where he made explorations and for some months commanded an Annamese gunboat. Next year he returned to France, where he was occupied for some years in preparing hydrographic charts of Annam, in writing articles regarding the coast of that country and the province of Hué, and in composing a book giving an account of his voyage and a *résumé* of his observations. At the same time he was patiently examining and collating every available document or record that could throw light on the geography and cartography of South-Eastern Asia, and at length produced as the condensed result of his labours a grand general map of the whole of Indo-China. This map was in 1880 presented to the Paris Geographical Society, and figured in the following year at the International Geographical Congress which was held in Venice.

We find M. Dutreuil de Rhins in 1882 in Egypt, and accompanying from thence M. S. de Brazza to the banks of the river Ogowé in French Congo. The result of this journey to geography was a good survey of the course of the Ogowé, which was published afterwards by the Minister of Instruction. On returning to France he turned his attention to the cartography of Central Asia, which was imperfect and more or less erroneous. He therefore set himself to reconstruct it, and to this end he most carefully scrutinised all the original sources of information. The result of his studies was his comprehensive *Mémoire Géographique sur le Thibet oriental*, with five maps, and his great work, *L'Asie Centrale*, with an atlas of twenty-four maps. It is not surprising that, having completed these labours, he should have wished to visit the regions which had so long occupied his attention. He left France in 1891, accompanied by a young Orientalist, M. Grénard, on an exploring mission to Tibet, of which the charges were to be defrayed by the State. The travellers reached Tashkend early in April, whence, by way of Ferghana and Kashgar, they arrived at Khotan, which they made their headquarters for the exploration of all the surrounding regions. Among other places, they visited Leh, the capital of Ladak, whence they returned to Khotan at the end of November 1892. During the winter M. Dutreuil de Rhins was engaged in arranging his collections and making other preparations for his return to Europe through China. How far he had proceeded on the return journey is not exactly known, further than that he had succeeded in crossing the Astyn Tagh. It is to be hoped that his companion will be able to return and bring with him his journals and collections.

Richard Spruce.—This distinguished botanist and traveller died on the 29th December 1893 at Castle Howard, Malton, the place of his birth. He was the son of a schoolmaster, and in his early life made himself such a proficient in botany that Sir Joseph Hooker, Von Humboldt, and other leading men of science were led to take an interest in him. Having visited the north of Spain, he produced his work entitled *The Muscology of the Pyrenees*, which attracted

much notice. In 1849 he was sent by the authorities of the Kew Gardens to South America, and during his sojourn there of fifteen years prosecuted investigations rich in results both to botany and geography, and, we may add, to commerce. He crossed the American continent from ocean to ocean, passing through regions which no European before him had visited. He made, also, a thorough exploration of the river Amazons. He was one of the pioneers who introduced the quinine-yielding tree into India. He collected and described some 7000 species of plants and trees, some of which have proved of considerable commercial value. The Government, on his return to England, rewarded his services with a pension. The rest of his life he passed in quiet retirement in his native place.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Lectures in December.

On Dec. 6th, Mr. W. M. Conway, M.A., delivered an address in Edinburgh on "Himalayan Exploration." The chair was taken by Colonel Cadell, V.C.; and a vote of thanks was awarded to the lecturer on the motion of Sir Alex. Christison, Bart.

On Dec. 13th, Dr. H. R. Mill lectured before the Society in Edinburgh on "The Geographical Work of the Future." Professor Copeland presided; and Mr. W. B. Blaikie proposed a vote of thanks to the lecturer, which was seconded by Dr. John Murray.

A Christmas lecture to young people was delivered in the Society's Hall on Dec. 27th, by Dr. Wm. Gunn, from the New Hebrides. The subject was, "Among the Cannibals of the South Seas."

Lectures in January.

On Thursday, January 24th, Sir W. Renny Watson will lecture in the Society's Hall, Edinburgh, on "Hawaii."

It is also expected that Mr. Smith, of Glasgow, will deliver a lecture on Andorra at Edinburgh and the Branches.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

Geodetic Measurements.—The measurements executed in Europe during recent years are, according to Professor R. Gauthier of Geneva, as follows:—The old meridian of France has been prolonged northward to the Shetland Isles, and southward to Algeria, extending along an arc of 28°. The arc through Scandinavia, Germany, Austria, and Italy measures 30°, and that through Scandinavia, Russia, and Rumania 27°. The most important parallels measured are: one running from

the west coast of Ireland to Orsk in Orenburg over 69° of longitude, and another starting from the north-western extremity of Spain and reaching the Black Sea, 39° in length.

In India a meridional arc, 24° in length, has been measured. In Peru it is proposed to execute a new geodetic measurement, and the Academy of Sciences in Stockholm intends to measure an arc of 4½° in Spitzbergen between lat. 76 and 81. The progress of precise levelling operations has gradually diminished the differences between the recorded levels of various seas. At present the variations are reduced to four or six inches. A zero level for all nations has yet to be fixed.—*Mouvement Géogr.*, Sept. 16th.

Height of the Sea Breeze at Toulon.—Two interesting voyages were made in the balloon, *Amiral Avellan*, on Oct. 16th and 18th, 1893. On the 16th MM. Louis Godard and Jacques Courty ascended from Toulon at 11.20 A.M., and were carried by a south-south-west wind towards Fort Faron. But at a height of about 1600 feet the balloon began to turn towards the south, and at a height of 3450 feet its course was due south. After passing the coast at an elevation of 4690 feet, it was carried by a north-easterly wind over the roadstead and the peninsula of Cepet. The aëronauts then descended, and found a south-westerly wind at an altitude of 1000 feet. On the second occasion an ascent was made at 4.20 P.M., and an easterly current was found up to a height of 1300 feet. At 2000 feet the balloon was suddenly driven southwards towards the sea, and on descending to 520 feet entered the easterly current again, and was carried to the château of La Valerane on the Golfe de Giens. From these experiences it appears that the land and sea-breezes on the coast attain only a moderate height, at most 3000 feet, and there give place to the general currents of the atmosphere. The limit is subject to constant changes, which must be controlled by the transition from day to night. The influence of the seasons on these breezes has still to be investigated. The change in the direction of the wind occurred at a much lower altitude, 300 to 400 feet, during the balloon experiments at New York in 1887. On Oct. 16th and 18th Toulon lay at the south-eastern edge of an area of maximum pressure, with a fairly uniform pressure and light easterly winds in the neighbourhood.—*Annalen der Hydrographie*, Heft viii., 1894.

Bosnia and Herzegovina.—In the *Nouvelles Géogr.*, No. 8, M. D. Bellet shows what great progress these countries have made since their annexation by Austria. Under Turkish administration the *aga* received a quarter to a half of the crops, according to the contributions he made in seed or animal labour and the quality of the soil. This system is in vogue under Austrian rule ; but many peasants have freed their lands from these obligations, and, whereas they formerly spent as little labour as was necessary to procure means of subsistence, and used the most primitive implements, they now display considerable energy, and have made great progress in their agricultural processes.

The area of the country is 19,750 square miles, comprising 96,245 acres of garden ground, 11,984 of vineyards, 308,280 of meadow land, 6,545,680 of forests, and 294,050 of arable land. Whereas in 1872 only 40 per cent. of the cultivable land was properly exploited, in 1891 the proportion had reached 75 per cent. The cultivation of oats has sprung up almost entirely since the Austrian occupation. Tobacco-planting, under Government control, has made great strides. Vines are gaining importance daily. Good wine is made, which might be further improved by more careful manufacture ; and prunes and raisins are exported in increasing quantities. The numbers of cattle, horses, mules, and other domestic animals have considerably increased.

The forests cover more than half the area of the country. The prevailing species is the purple beech ; in the north grow fine oaks, and in the south there are some excellent resinous trees. The revenue derived from the forests rose from £8000 in 1882 to £38,660 in 1891. Near Doboi cask-staves are manufactured which are much esteemed at Bordeaux.

In 1891 the total exports of Bosnia and Herzegovina were valued at £1,156,760, and the imports at £1,223,240.

The progress that has taken place is due to the energy of Herr von Kallay, Minister of Finance, who has imported stallions from Austria, bulls from Styria, and asses from Cyprus, has encouraged irrigation and caused the peasants to be instructed in dairy work, the breeding of fowls, and horticulture. He has laid out nurseries, where the people can obtain young plants gratis, and has established loan offices to save the peasants from the exactions of the usurers. The silk industry is encouraged, and tanneries, breweries, sugar refineries, foundries, and other works have been established. Railways and roads have been constructed, and the former now comprise 63 miles of main line from Doberlin to Banjaluka, and 337 of narrow-gauge lines. The country is rich in minerals—coal, iron, copper, manganese, antimony, mercury, and argentiferous lead—and no doubt progress will be made in the development of the mining industry. Since 1879 the population has increased by 15 per cent., and the commerce by 60 per cent. in ten years.

The Southern Ural.—It was until recently believed that the Ural to the south of Yurma consisted of three radiating ranges—the western or Urengaiskaia, the middle or Ural proper, and the Ilmen in the east. But MM. A. P. Karpinski and F. N. Chernysheff have discovered that the Ilmen is not connected with Yurma ; it runs past it and extends northwards. The Ural proper also forms a long separate range, while the Yurma belongs to the western range, which is parallel to the central and surpasses it in height. The southern Ural does not exceed 3300 feet, while the western often attains an elevation of 4000 or 5000 feet. The Yurma itself is 3375 feet high. Separated from it by a wooded and swampy valley is the Taganai, with a summit 3900 feet high : it runs south-westwards to the Urenga ridge near Zlatoust, and the line of elevation is continued by the Ivaldy and Yagodnia, which are separated from the Avaliak ridge on the east by the valley of the Upper Tiuliuk and from Iremel on the south. The Iremel, rising between the upper courses of the Tyghin and Isseniat, has at first an east and westerly direction, but afterwards bends sharply to the south and south-west. The south-western part is the Iremel proper ; its highest summit has been variously given at from 5038 to 5245 feet. Here intervenes an interruption in the series of chains running in a south-westerly direction ; the Bashtur runs from south-east to north-west, and the original direction is only found again along the Great Inser river, where the Mayardak and other chains take a south-westerly direction. Still farther south lies the great Yaman-tau, 5399 feet high, of which little is known. South of the Yaman-tau is the Biktiatur range, and to the west the isolated Karatash. Here is a large number of parallel chains. Seven such chains may be counted to the west of the Ural on the latitude of the Great Yaman-tau, and nearly as many on the latitude of Iremel. The last mentioned is not the highest summit of the Urals ; it yields to the Great Yaman-tau and the Tol-poss-iss, 5432 feet high. Its position is between 55° 30′ and 54° N. lat. The summit forms an extensive plateau, at the extremities of which rise two huge blocks of stone, the eastern being 400 feet high and the western only six or seven. The ridge consists of quartzite and slates, and its slopes are covered with *débris* from these rocks. —*Globus*, Bd. lxvi. No. 8.

ASIA.

Lombok or Tanah-Sassak, where the Dutch Government has lately had trouble with the natives, is situated to the east of the island of Bali, from which it is separated by the Lombok Strait. Its area is about 2100 square miles. Two ranges of mountains traverse it from east to west; the northern range containing several volcanoes and the highest summit of the Indian archipelago, the Renjani or peak of Lombok, about 13,000 feet above sea-level. The rivers are numerous, and render the soil very fertile; but none of them is navigable.

Lombok is remarkable as forming the eastern limit of the Australian fauna, the island of Bali, separated from it only by a narrow strait, lying in the Asiatic region. The flora differs from that of Java and Bali in the absence of the arenga and lontar palms (*Arenga saccharifera* and *Borassus flabelliformis*), of teak (*Tectonia grandis*), and in the comparative scarcity of orchids, ferns, and mosses. Neither tigers nor any other of the feline species are found in Lombok. The oriole of Malaysia and the starling of Japan are never found here, but in their place the cockatoos and the *Melaphagides* of Australasia. Fertile plains extend to the east and west, where rice, maize, cotton, tobacco, and sugar are cultivated; in the interior indigo and coffee are grown. Large quantities of rice are exported to the other islands of the archipelago, and even to Singapore and China. The population consists of about 400,000 native Sassak, 20,000 Balinese, and 5000 Malays. The Sassak are mostly Mussulmans, while the Balinese, the ruling race, are Brahminists. They invaded the island during the first half of the eighteenth century. The laws are very severe; theft is punished with death. Games of chance and opium-smoking are forbidden. The army is well trained, as the Dutch have lately experienced; it consists of 20,000 men and a hundred cannons. The roads are excellent, and bridges are thrown across the rivers—a contrivance not to be found in Bali.

Lombok possesses great mineral wealth, particularly large veins of tin.—*Revue de Géographie*, November 1894.

AFRICA.

Mount Mfumbiro.—This mountain, first seen by Speke in 1861, afterwards by Stanley, and discovered by Emin Pasha and Dr. Stuhlmann to be an active volcano, was ascended by Count von Götzen in June last. The natives apply the name, or rather Ufumbiro, as it should be written, to the most eastern of the group as well as to the surrounding country. The summits are named by the Wanyaruanda, in order from east to west, as follows:—Ufumbiro, Vihunga, Karisimbi, Navunge, and Kirunga-cha-gongo (place of sacrifice). To reach the last, which is the volcano, the travellers had to twice cross the river Nyavarongo, which is certainly the largest of the head-waters of the Kagera. After three days' hard work in cutting a way through the bush, Count von Götzen's party stood on the summit; it has an altitude of 11,220 feet. From the edge of the crater the walls, 350 feet high, descend to an arena of nearly a mile in diameter. The bottom is even and of a yellowish-brown colour, and in it are two shafts from which red gleaming smoke rises at irregular intervals, probably proceeding from a lake of lava. At the foot of the mountain is situated the Kivu lake, from which the Rusizi is said to flow to Tanganika. Its level lies at 4900 feet above sea-level. Probably it is not much smaller than the Albert Edward, for neither from the south nor from the west bank could the opposite shore be seen. In East Ruanda the Count passed a lake, forty or fifty miles long and one to three wide, named

Mohasi. Its northern point lies where Stuhlmann's Kisege is marked on his map, and its direction runs towards the south-east. The Oso and Kivu lakes are probably the same.—*Verhandl. der Gesell. für Erdkunde zu Berlin*, Bd. xxi. No. 8.

The Congo.—Mr. Mohun, the United States Consul, has lately explored the hitherto unknown section of the Congo lying between Kasongo and the confluence of the Lukuga. The river was seen near Kasongo by Livingstone in 1871, by Cameron in 1874, and by Stanley in 1876, but no one had followed the river southward to the Lukuga, where, in 1892, M. Delcommune was obliged to diverge westwards (see vol. ix. p. 316). The distance between these points is 84 miles. Now the river is known from its mouth to Ankoro, at the confluence of the Lukuga; and it only remains to survey the section from Ankoro to Lake Kassali, and the immediate neighbourhood of the source (the Upper Lubudi).

The new section explored by Mr. Mohun and Dr. Hinde, lying between 4° 30′ and 5° 30′ S. lat., is almost completely barred by rapids. The travellers ascended the river in canoes, but in some of the most difficult places were obliged to send their men on shore to pull the boats along. The breadth of the stream varies considerably; between Mutabelli and Sangha (lat. about 4° 18′), it expands to some 2700 yards, while farther up it is reduced to 100 yards. Here Mr. Mohun mentions a strikingly picturesque reach, which he names the *Portes d'enfer* (lat. 5° 8′), where the river, 195 yards broad, rushes between a hill 400 feet high and a granite cliff, while from its bed rise two monoliths of granite 90 to 100 feet high, dividin the raging stream into three channels. From the confluence of the Luama (lat. about 4° 43′) to Kongola (lat. about 5° 12′), the valley is narrow and enclosed by hills rising sometimes to a height of 3300, or even 3900 feet. At about lat. 4° 56′ are two striking elevations, one on the west (4400 feet), to which Mr. Mohun gave the name of Mount Cleveland, and the other on the east (3100 feet), which he named Mount Dhanis. Immediately above Kongola the valley widens, and the river begins to form the chain of lakes mentioned first by Cameron. The two expansions seen by Mr. Mohun are probably the Lake Lanji of Cameron, though the name was not heard during the journey. The water is very low in this part of the river during January and February; about the first of March it begins to rise, and by the middle of April most of the dangerous rapids are covered with water, and navigation becomes easy. From March 18th to April 15th the water rose at the Portes d'enfer 14¾ feet. The soil of the valley is extremely rich, and the population, especially in the lower part, is very dense. The natives, of the Barua tribe, were friendly.—*Mouvement Géogr.*, Sept. 30th.

AMERICA.

Lieut. Peary's Second Expedition to North Greenland.—In *Globus*, Bd. lxvi. No. 19, is published a letter from Eivind Astrup, Lieut. Peary's companion in travel. As is now well known, the expedition of 1893-94 has not been a success, and Herr Astrup has little geographical information to communicate. Eight mules were brought from Philadelphia, but only three were living when the *Falcon* reached Inglefield Gulf, and these soon proved to be useless in the severe climate of Greenland. Another misfortune was that the greater part of the pemmican was spoilt, and Astrup was, in consequence, laid up with typhus fever. On November 1st a new catastrophe occurred; a wave, caused by the calving of an iceberg, rose twenty feet above high-water mark and swept away thirty-two casks of paraffin oil, all but four of which were recovered, but these had sprung a leak and lost part of their contents. The winter was, on the whole, milder than the former, the lowest temperature being −34° F., while in the winter of 1891-92 it was −52°; but the

spring was cold and late. On March 9th the members of the expedition assembled at the depôt formed in autumn on the inland ice, four miles from the coast and at an elevation of 3000 feet. Here Astrup again felt the effects of the pemmican so seriously that he was obliged to return to the winter house. Peary started on March 15th, and on the 26th Dr. Vincent came back with Davidson, whose foot was frozen during a violent equinoctial storm which raged on the 22nd and 23rd. In the height of the storm the temperature was nearly $-50°$ F., a unique experience with such a strong wind. Several dogs were frozen, and all the rest more or less affected. In the meantime, Astrup made an excursion by sledge along the coast of Melville Bay, and made some discoveries, among them that of the largest glacier of Greenland yet known. On his return, on May 1st, he found Peary back at the house. The expedition had had to be abandoned; the number of dogs had been much diminished by repeated storms and great cold, Herr Entriken's feet were frozen, and the other travellers had suffered severely. Peary, accompanied by Lee and the Negro, Matt, are still at the winter house, and intend to try their fortune another year.

The United States.—The north-east corner of Utah, named by travellers "The Treasure-Vault of Utah," has hitherto been an Indian reserve. It is bounded by the Uintah, Wasatch, and White River mountains, and covers an area of about 40,000 acres. This region is now restored to the public domain and thrown open for settlement. An agreement has also been made with the Yankton tribe of Sioux Indians, by which they surrender to the United States about 300,000 acres in South Dakota. The Alsea Indians cede about 60,000 acres in Oregon, and the Nez Percé some 500,000 acres in Idaho. The Indian reservations are fast disappearing from the map of the United States.

The re-survey and erection of monuments has been completed on the Mexican frontier for about 700 miles, from El Paso to the Pacific, and the entire preliminary survey of the line between Alaska and the British Possessions has been brought to a conclusion. Mr. M'Grath's latest observations confirm his former determinations of the height of Mount Logan—19,500 feet, or some 1500 feet higher than St. Elias. A number of Lapps, with their reindeer, have been settled in Alaska. It is hoped that the natives may become familiarised with the use and management of this animal, and that by this means their food supply may be increased.

Three important projects have been considered by Congress during the past session: first, the construction of a railway from the Dalles Rapids to the Celio Falls on the Columbia river for the transport of steamboats, which will be raised on to cars by a hydraulic lift. The length will be thirteen miles, and the cost is estimated at about £400,000. The second scheme is the enlargement of the waterway between Puget Sound and Lakes Union and Washington, and its conversion into a ship-canal. The third is to extend navigation from St. Paul to Minneapolis by the construction of a dam and lock at the rapids of the Mississippi river between those towns.—*Bull. of the American Geogr. Soc.*, vol. xxvi., No. 23.

GENERAL.

The Upper Atmosphere.—On July 7th, 1894, Professor Assmann set free at Charlottenburg a balloon, equipped with self-registering apparatus for the determination of meteorological data in the higher regions of the atmosphere. This balloon, the *Cirrus*, made a most remarkable voyage, for not only did it reach the greatest altitude ever attained by any contrivance made by human hands, but it also in eleven hours made a journey from Berlin to the district of Zvornik in Bosnia, a distance of more than 620 miles. The scheme of exploring the upper

air by means of small balloons was first proposed by Geheimrat A. Meydenbaur and put into practice in France; but these attempts failed because no measures were taken to guard against the powerful effects of solar radiation on the instruments. This was rendered possible by the aspiration principle applied by Prof. Assmann, and, after many trials, a camera largely composed of aluminium was constructed by R. Fuess, in which an alcohol thermometer and the lever of a barograph could be photographed through a slit on to a silver-bromide gelatine paper stretched on a drum. On the morning of July 7th the *Cirrus* was released, shot up "like a champagne cork," sailed first towards the north-west, and at a greater height turned round towards the south-east, finally coming to earth in Bosnia close to the Servian frontier. The meteorologist Berson, who went to fetch the balloon, was only able with all possible haste to reach the spot in fifty-four hours, while the balloon had made the journey in twelve hours. The apparatus was hardly injured at all; and the photogram, unrolled ten days later, showed clearly the pressure and temperature of the regions traversed by the balloon. When the balloon rose the pressure was 30 inches and the temperature of the air 62·6° F. Both naturally diminished with the height, the pressure to 3·35 inches and the temperature to – 61·6° F. Here the record breaks off, for the paper was not large enough, such low pressures not having been expected. According to a careful calculation, the height then attained must have been 53,559 feet, or not much less than twice that of Mount Everest, the highest mountain of the world. Evidently the balloon had ascended still higher, but its highest point could not be recorded. Besides, the registering apparatus was arranged for six hours only. It is to be altered so as to record lower pressures and to act for twelve hours.—*Verhandl. der Gesell. für Erdkunde zu Berlin*, Bd. xxxi. No. 8.

Petroleum and Natural Gas.—A very interesting paper on this subject, by Mr. H. M. Cadell, has been published in the *Transactions of the Edinburgh Geological Society*, vol. vii. p. 51. After detailing the geographical distribution of these valuable deposits, the author turns to their geological distribution. In the States of New York, Pennsylvania, and Ohio they occur in beds averaging something like 6000 feet in thickness, and belonging to the Lower and Upper Silurian, Devonian, and Carboniferous systems, while on the Caspian they exist in coarse sand-beds of Eocene age. In California the natural hydrocarbons occur in highly inclined strata of Tertiary age, and differ also in many other respects from the oils of the eastern States, especially in having asphaltum instead of paraffin as their base, in consequence of which they are more important as fuels than as illuminating products.

As regards the origin of the hydrocarbons, there are two theories, of which one ascribes to them a purely mineral source, while the other attributes their formation to the decomposition of organisms. The former being a purely chemical hypothesis, cannot be verified by the geologist. Professor Sterry Hunt, an adherent of the organic theory, supposes the oil and gas to be produced by the primary decomposition of organisms in the rock itself, while Professor Newbery holds that decomposition has been accompanied by a slow process of distillation. Professor Peckham, again, limits the distillation to the time of the elevation and metamorphism of the Appalachian mountain system, when it was maintained by the heat then prevailing in the region. Professor Hunt's theory suffices to account for most of the phenomena, and is the simplest.

The anticlinal theory, worked out in great detail by Professor J. C. White and others, is now generally accepted as showing how the oil is accumulated in large quantities in certain places. Oil-wells yield three products — oil, gas, and

brine. Where the strata lie in great flat anticlines and synclines, gas is given out from borings at the top of the flexures, brine from the trough, and oil from the intermediate zone. Evidently, then, the heavy salt water, when it became mixed with oily matter through decomposition, sank to the lowest attainable level, leaving the oil floating on its surface, while the still lighter gas rose to the crown of the arch.

The chief oil-producing regions of the world are, as is well known, in America and on the Caspian Sea. The latter have been worked for 2500 years, and as yet show no signs of exhaustion. The production has increased rapidly of late years, and in 1893 amounted to 5,436,318 tons of crude petroleum, equal to 38,554,226 barrels of 42 gallons each. The force and volume of oil proceeding from the Baku wells is most remarkable. The great Droojba fountain of 1883 shot up a column of sand and oil to a height of 300 feet, and poured forth 220,000 tons of oil in the first four months, while during the last two years still greater fountains have been struck, one of which started off with 1600 tons a day. In America the wells are less violent, and do not generally continue to produce oil for more than five years. The production of American petroleum reached its zenith in 1891, when the quantity was over 54 million barrels. The price reached the minimum in the following year, and has since begun to rise.

Mr. Cadell gives also much information regarding the chemical composition of the oil, on natural gas, the pressure on the gas, etc.

MISCELLANEOUS.

The **Delagoa Railway** is now open to Pretoria.

Señor R. Gutierrez has recently explored the neighbourhood of El Purace, the most imposing volcano of **Colombia**, and has discovered a prehistoric city of colossal proportions.—*South American Journal*, November 10th.

The French Academy of Science has awarded to **Dr. John Murray** the Cuvier prize. This prize is given to distinguished naturalists, and the former recipients were :—Agassiz, Richard Owen, Von Baer, Oswald Heer, Von Beneden, and Leidy.

In the *Quarterly Statement*, October, of the Palestine Exploration Fund, Dr. Bliss publishes a second report on the excavations at **Jerusalem**, in continuation of his paper in the July number. A line of rock, scarped for fortification, has been traced for over 300 feet, and also a paved street leading to a gate in a wall inside this scarp, which is in all probability the Dung Gate of Scripture.

Colonel Godwin-Austen writes to correct an error in "**Bhutan and the Himalayas East of Darjeeling.**" On p. 635, vol. x., it is stated that Sir Ashley Eden's mission "followed Pemberton's route, entering Bhutan from the west," whereas Pemberton entered from the east, and the mission to which Colonel Godwin-Austen was attached travelled by a new route. On p. 639 Dok*im* La should have been printed Dok*ieu* La.

A new port has been opened to trade on the coast of **Guatemala**. A spacious pier 1200 feet long, with 22 feet of water alongside, has been constructed at Puerto Barrios, which is the northern terminus of a railway intended to connect it with the city of Guatemala. When this line, of which one-third is already constructed, is completed, the journey from the Atlantic to San Juan on the Pacific will be accomplished in ten hours. — *South American Journal*, October 27th.

The new free port of **Copenhagen** was opened to trade in November. It contains an area of 8770 acres and a water surface of 5980 acres. The entrance, 30 feet deep, is protected from the waves of the open sea by a huge breakwater. At the same time a promenade nearly 2½ miles long has been constructed, from which a fine view is obtained of the roadstead, the sound, the island of Hven and Sweden on the one side, and of the town and wooded coast on the other.—*Deutsche Rundschau*, Jahrg. xvii., Heft 3.

In August last Lieutenant Pashtukhoff made another ascent of **Mount Ararat**. The thermometers left there the previous year showed a minimum temperature of −39·7° F. and a maximum of 31·5°. The latter, however, cannot be accepted as correct, for the thermometer was enclosed in a metal box, which would be very susceptible to solar radiation. The highest point of the mountain is not covered with snow, and the exposed part had increased since the last year, so that it occasionally thaws even on the summit.—*Deutsche Rundschau*, Jahrg. xvii., Heft 3.

Dr. Rouire believes that he has discovered the ancient **Lake Triton** in the long lagoon on the coast of the Gulf of Hammamet, named Halk-el-Mengel. The lagoon is now in great part dried up; but even as late as Roman times it was navigable, and ships could enter the lake from the sea. Dr. Rouire's explorations have resulted in the discovery of an ancient port, where the lagoon opens to the sea. It was connected with the lagoon by a channel artificially excavated in the rock.—*Bull. de la Soc. de Géogr. de Marseille*, 3me. trim., 1894.

In the *Transactions of the Edinburgh Geological Society* Mr. H. M. Cadell makes some remarks on the new **Geological Map of the Edinburgh District**. Many of the changes since the first publication are due to improvements in mapping and petrographical nomenclature. Thus the Felstones of the old map, composing the greater part of the eastern end of the Pentlands, are now denoted as Andesites and Porphyrites, while many of the more ashy spots are recognised as plugged-up pipes of old volcanoes. Again, the calciferous series is now extended over a considerable part of Fife. The area between the Firth of Forth and Cobbinshaw, with its complicated structure, has been revised. Within it are situated the West Calder oil shales, and Mr. Cadell estimates the approximate thickness of this group at about 3100 feet.

NEW BOOKS.

The Great Ice Age and its Relation to the Antiquity of Man. By Professor James Geikie, LL.D., D.C.L., F.R.S., etc. Third Edition. London: E. Stanford, 1894. Pp. 850. *Price* 25*s.*

Since the publication of the second edition of this well-known book, seventeen years ago, the number of workers in glacial geology and the fruits of their work have largely increased. Such advances have been made, that the author has found it necessary to re-write nearly the whole of the book to bring it into line with our present state of knowledge of the Glacial Period. His aim has been, not to write a history of the rise and progress of glacial geology, but to sketch the present position of this department of geological science. Some idea of the enormous amount of laborious and patient work which this has involved may be formed from the fact that Professor Geikie has not only travelled over most of the countries he deals with, but has laid under contribution no less than six hundred and twenty different authorities, ranging from Ossian and Tacitus to Darwin, Nordenskjöld, and Nansen.

Since the late James Croll promulgated his famous physical theory of the cause of the Glacial Period, with its alternations of great cold and genial climate, glacialists have been busy hunting up evidence as to the number of warm and cold climatic waves that rolled over northern Europe and America in the Pleistocene Period. The appearance of this volume has been eagerly anticipated by Continental geologists, who are waiting to learn Professor Geikie's latest verdict on this important point. At page 612 we read that he now reckons the number of mild interglacial periods at five, and he adduces evidence of six distinct epochs of more or less severe cold during what is known as the Ice Age. In the previous edition, only three distinct cold periods were recognised, and it may be some time before geologists are prepared to accept unreservedly such a substantial addition to the list. The question of the relation to the Ice Age of the early inhabitants of Europe receives much attention, of course, and the author reserves his opinion as to whether man really inhabited this part of the world in pre-glacial times. It is, however, made abundantly clear that palæolithic man left his chipped flint implements among the gravels of the second interglacial period, and that during the third glacial epoch he retired to Southern Europe, where he lived in caves and rock-shelters while the cold was at its height in the north. The extension of the northern ice-sheets during the second, third, and fourth glacial epochs in Europe is shown in three excellent coloured maps, which appear for the first time in this edition. Another highly interesting map is given, which indicates the configuration of North-West Europe after the fourth glacial period, or epoch of the great Baltic glacier, when the British Isles formed part of the mainland, and were connected with the Faroë Isles and Iceland by a long tongue of land.

At page 706 we read that the mammoth lived through the greater part of the Pleistocene Period, but his race finally disappeared before the close of the Ice Age. It would appear, however, that here, for once, our author is in error. Of late, the mammoth seems to have come to life again in full vigour, this time, however, embodied in the less weighty form of a certain Member of Parliament, who has risen up to relate the true history of his period. Many are the rents that this being has sought to tear, with his long tusks, in Geikie's volume, and loud are his bellowings at the slightness of the impression he has hitherto been able to make in this direction. Ramsay's Rock Basin theory, for example, as set forth at length in chapter xviii., seems to act like a red rag to this angry critic, who will not admit the capability of glaciers to excavate hollows in the rock over which they flow. The question is one of much geographical interest, and deserves a passing notice here. Whether or not a mass of flowing ice can scoop out a hollow in the rock, one geographical fact is quite evident, namely, that the parts of North America and Europe over which the maps show the great ice-sheets and valley glaciers to have flowed, are precisely the areas now most abundantly sprinkled over with lakes, and, conversely, the regions where there are otherwise no traces of former glaciation are the very regions in which the lakes are conspicuous by their absence. It seems to us that Geikie's position is here absolutely unassailable, and that no consideration hitherto urged against it, in Europe at least, has in the least degree shaken Ramsay's hypothesis.

A chapter has been added in this edition by Professor T. C. Chamberlin, of Chicago, on the glacial phenomena of North America, accompanied by an interesting map of the great American ice-sheet. The last chapter deals with the cause of glacial periods; and here the author admits that although the theory of Croll, of which he has hitherto been a strong supporter, has undoubtedly thrown a flood of light on the question, a complete solution of the problem has not yet been found.

In each new edition the book becomes more cosmopolitan in scope, and Scotland

bulks relatively less largely in its pages than it did at first. It is, however, a work of which all Scotsmen may well feel proud; and we must congratulate Professor Geikie in having brought his arduous labours to a successful close, and in having added yet another classic volume to the archives of earth-lore—archives on whose shelves the works of our countrymen have long occupied such a distinguished place.

From Edinburgh to the Antarctic: An Artist's Notes and Sketches during the Dundee Antarctic Expedition of 1892-93. By W. G. Burn Murdoch. With a Chapter by W. S. Bruce, Naturalist of the Barque *Balæna*. London: Longmans, Green, and Co., 1894. Pp. ix + 364. *Price* 18*s*.

Seldom, we fancy, has an artist penetrated so far south in search of subjects as the icy Antarctic regions. How Mr. Burn Murdoch came to join a whaling expedition, and how he lived and sketched on board the good ship *Balæna*, he tells us in the present volume. The first three months of the cruise furnished few matters of interest beyond the ordinary routine of life on board ship, the visit of Neptune and his satellites, and chatty glimpses of the men and boys who made up the crew of the *Balæna*. One of four whalers bound for the Antarctic seas, she left Dundee on the 7th September 1892, and reached the Falklands on the 8th of December. Her object was the catching of whales (the Bowhead, or "*Balæna mysticetus*"), seen in the Antarctic regions by Ross in 1893; but of these none was seen. Of seals, however, large numbers were seen and caught. "29*th Jan.* '93.—We have now on board 4800 seals, killed in twenty-eight days. Our decks are piled with their skins and blubber high above the rail—a gory heap weighing more than 100 tons." Exploration had no part in the *Balæna's* programme; but "Captain Davidson of the *Active* discovered that Joinville Land does not continue to Cape Fitzroy, but is separated from the land to the south by a strait, through which he navigated the *Active*. Captain Davidson called the land Dundee Island; and the strait the Firth of Tay." The most interesting portions of Mr. Burn Murdoch's book are, undoubtedly, the descriptive touches of Tropical and Antarctic sea and sky. He writes in a graphic manner throughout; the style, racy in some parts, has in others a touch of literary deftness and a vein of originality which make it attractive reading. He treats of Nature from the point of view of an artist, who believes in painting as "the purest form of worship." He tells us of "the infinite subtleties of the harmonies in white, and silver, and green, and pale yellow, and blue . . . an endless fairy picture, painted on silk, with a ghostly brush from a palette of pearl," and speaks of the difficulty of reproducing the different "high-toned schemes of variously tinted white." That he has succeeded so far is evident from the charming sketches with which the attractiveness of the book is enhanced, although those who have seen the original drawings, and their clever treatment of the snow and ice mountains, can sympathise with the artist's complaint against the photographic modes of reproduction. Mr. Burn Murdoch's instinct for sport is also strong, and he enjoys penguin and seal-shooting in the Antarctic region as much as grouse and salmon killing at home. Mr. Bruce's chapter is a strong plea for systematic scientific exploration of the whole South Polar regions, and he gives interesting particulars of the small researches he was able to make. A very clear map of the voyage accompanies the volume.

Peru: Beobachtungen und Studien über das Land und seine Bewohner. Von E. W. Middendorf. II. Band. Berlin, 1894. Pp. xii + 425.

The first volume of this important work was noticed in this *Magazine* in the number for February last. It contained a general survey of Peru and of the races by which it is inhabited; a sketch of its history from the Spanish conquest to the

proclamation of its independence in 1824; an account of its republican form of government and of its public institutions, both civil and sacred; and, lastly, a description of Lima, the capital city, and of its seaport, Callao. The present volume is devoted to a description of the whole of the coastland from Tumbez in the extreme north (3° 33′ S. lat.) to the southern extremity of Arequipa (18° S. lat.). It quite maintains the high standard of excellence by which the first volume was distinguished. The style is easy and lucid, and the information given on all the subjects discussed is at once copious and accurate. The author, in fact, saw with his own eyes almost all the places and objects which he here presents to notice. This part of his work has, therefore, rather the nature of a book of travels than of a gazetteer with a dry compendium of information gathered from a variety of sources. The main object he kept in view, during the excursions which made him familiar with all parts of the coast region, was to search for and examine the remains of old Indian buildings, and to compare them with each other as a means of ascertaining what amount of culture had been attained by the natives before they had come into contact with Europeans. The credit of the architectural skill and progress in other arts, of which these remains give proof, has generally been accorded to the Incas. Dr. Middendorf, however, while acknowledging that the Incas were the most powerful and the best organised of all the civilised races of South America, yet holds that there were other races which were not only prior to them, but which had in some respects attained a more advanced stage of culture, though their superiority in that respect did not enable them to maintain their independence against the Incas, who excelled them in statecraft and the military art. Among the curiosities discovered amid the ruins of the old buildings are mummies, which have been preserved from decay by the dryness of the air without the use of aromatics. Beside the mummies are found placed such objects as were dear to them in life, including even mummies of their favourite domestic animals. Our author attributes the care shown by the old Peruvian races for the preservation of their dead to their profound belief in personal existence after death. The chief burying-place was at Pachacamak, where there was a famous temple of the sun.

Dr. Middendorf, while ardently prosecuting his archæological researches, was not so absorbed in them as to neglect other inquiries. On the contrary, he let no subject of any interest or moment pass unnoticed, and we find throughout his pages such topics treated of as the state of agriculture, the history of railway enterprise, of the traffic in guano, and of the Chilian war which proved so disastrous to Peru. Good paper and printing, an excellent map of Peru, and numerous beautiful illustrations, all contribute to the attractiveness of the present instalment of this great work.

Les Italiens d'aujourd'hui. Par René Bazin. 2e Édition. Paris: Calmann Lévy, 1894. Pp. 315.

Like many others who have visited Italy, M. Bazin was deeply impressed by the striking contrast between the richness of the soil and the dire poverty of its cultivators. This he ascribes to the crushing taxation, which on land amounts to 33 per cent. of the net income. Another evil, arising not unnaturally out of the distress and poverty of the people, is Socialism, which seems to be making rapid strides. But it is rather surprising to learn that the chief propagators and teachers of this doctrine are none other than teachers in the primary schools, whose salaries are paid much in arrear, and who sometimes get nothing at all. As a Frenchman, the author is naturally opposed to the Triple Alliance, and seems to have done his best by assiduous questioning to get Members of Parliament and others to admit that the excessive taxation of the country, with the resulting poverty, was due

to the excessive armaments maintained out of deference to this Alliance, and that it would be greatly to the advantage of Italy to make friends with France. For M. Bazin is sincerely attached to the Italians and their country, and nothing would afford him greater satisfaction than to see the peninsula in a flourishing condition. But the answers he received were not always what he expected. He was very favourably impressed by a visit paid to the barracks of a regiment of the line. The polite behaviour of the men when visited by a stranger was a striking contrast to what would have happened if he had entered the barrack-rooms of a French regiment. The paternal interest of the colonel and his officers in their men was a revelation to him. In fact, all that he noticed was creditable to the Italian army.

The author discusses the causes of malaria in the Campagna, and sets it down to the extreme humidity of the soil. Something like 10,000 springs are known to exist in it—most of them without any regulated outflow ; and as the water cannot sink into the ground owing to an impenetrable underlying bed of lava, it forms marshes. The Italian Government, by its laws of 1878 and 1883, has done something towards remedying the evil ; but as some of their provisions are of doubtful wisdom, and the laws as a whole have been resisted by most of the landed proprietors, on whom falls nearly all the great expense of putting them in force, it cannot be said that any great progress has been made in staying the ravages of the malaria. For in Rome itself 23 per cent. of the inhabitants of the right bank of the Tiber and 33 per cent. of those on the left bank are annually attacked by malarial fever ; while in the marshy districts west of the capital the percentage of the agricultural population annually stricken by it amounts to no less than 95 per cent.

Many other topics are touched upon in a pleasant and sympathetic way, and the book is one that can well be recommended to those who take an interest in modern Italy and its people.

The Fringes of Fife. By John Geddie. Illustrated by Louis Weierter. Edinburgh : David Douglas, 1894. Pp. xii + 184.

This handsome volume is a charming record of a pilgrimage round the coast of the "Kingdom" of Fife, from Kincardine to St. Andrews. The title has been suggested by the saying of King James vi., that "Fife is a Beggar's Mantle with a Fringe of Gold." Every one who knows Fife at all is familiar with the succession of wonderfully quaint and picturesque little burghs that trim its coast. These old-world burghs, with their red-tiled roofs and crow-stepped gables, their squat church spires and town-hall steeples, probably Dutch, their forlorn graveyards and neglected harbours, are the delight of artists and of antiquaries. How many generations of artists have painted St. Monan's Parish Church and St. Serf's Tower, Dysart, it would be hard to say ; but though the subjects are ever old, they are, from the artistic point of view, ever new, as each artist mingles with their outstanding architectural features something of his own individuality. To this region Mr. Geddie proves an admirable guide, and like a true artist he puts into his word-pictures a great deal of himself. He not only writes in crisp, epigrammatic English, but weaves into his narrative and his descriptions of scenery an amount of antiquarian, historic, and legendary lore which is always delightful, and is often bewildering in its richness and amplitude. While he writes eloquently of Fife scenes and scenery, Mr. Geddie misses no opportunity of describing the characteristics of the Fife folk. The only regret one feels is that the later stages of the pilgrimage are dismissed so briefly, and especially that so little is said about St. Andrews. The illustrations by Mr. Louis Weierter are admirable, and add greatly to the charm of the volume.

Ways and Works in India; being an Account of the Public Works in that Country from the Earliest Times up to the Present Day. By G. W. MacGeorge, M.I.C.E., late Officiating Consulting Engineer to the Government of India for Railways. With numerous Illustrations and Maps. Westminster: Archibald Constable and Company, 1894. Pp. vi + 565. *Price* 16*s.*

Mr. MacGeorge has produced a most readable and valuable popular account of the great public works which have been executed in India, principally by the Government, and mostly within the last fifty years. Speaking with full knowledge, he affirms that in the whole history of Governments, not excluding that of ancient Rome, no alien ruling nation has ever stamped on the face of a country more enduring material monuments of its activity than England has done and is doing in her great Indian dependency. This is the literal, unvarnished truth; and if there be borne in mind the vast area of the country, and the financial and material difficulties encountered, these works may, as he says, be truly called stupendous. He has treated in successive chapters of (1) The Great Trigonometrical Survey; (2) Roads; (3) Irrigation Works; (4) Railways; (5) Water Supply of Towns; (6) Electric Telegraph; (7) Sea and Harbour Works. He has aimed at giving as far as possible in untechnical language a clear and interesting account of the progress historically, and of the principal works executed under each head, and has sought to convey an approximate idea of the enormous value and extent of each of the separate classes of public works regarded as a whole, and their important bearing on the material progress of the people. This task has been executed with great industry and ability. The chapters on Irrigation and Railways are the fullest and best; for the latter of these subjects he was specially qualified by the official position he held in India. The romantic story of the Great Trigonometrical Survey has been often told, and can never fail to charm; in the graphic and lucid account given by Mr. MacGeorge full justice is done to it. While the section on Roads is in many respects satisfactory, it is evident that here the author is more dependent on written authorities and speaks less from personal knowledge. Had he known India in the days before railways were made, he would not have described the Grand Trunk Road as going to Mirzapore: that great road crosses the Ganges at Benares, and then goes on the north side of the river to Allahabad—as his map correctly shows; and he would have avoided writing the name of the common road-metal in the cockney form of *kunka*. He might also have indicated with greater precision and clearness the more important trunk roads in the Great Gangetic Plain. But these are very minor defects, and do not detract from the substantial value of the work as a whole both in its conception and its execution. It has brought together much valuable information, and is admirably adapted for both the classes the author has kept in view—viz., the growing class of intelligent educated men in the Native community, and the general English public interested in the credit of their own country as responsible for the administration of the great Indian Empire.

Reminiscences of a Voyage to Shetland, Orkney, and Scotland in the Summer of 1839. By Christian Ployen, Amtmand and Commandant of the Faroe Islands. Translated from the Danish by Catherine Spence. Published at Copenhagen, 1840. Lerwick: T. and J. Manson, 1894. Pp. xv + 237.

Vague reports having reached the Färoe Islands regarding the invention of a turf-press whereby peat could be quickly dried and compressed, and thus made more expeditiously and with more economy than by the usual methods, the com-

mandant of the islands received permission from the Danish Government to proceed to Scotland to see the new machine, and, if satisfied with its utility, to purchase one or more, to procure seed-potatoes for the islanders, and to report upon the state of the fisheries and agriculture, and the various processes by which they were carried on. Shrewd, observant, remarkably free from prejudice, and with a warm desire to better the unhappy lot of those he governed, a better missionary would have been hard to find. Nothing escaped his observation and remark : from a fish-hook to a railway engine, from an oar to a cathedral. To all this he added a certain frankness concerning himself and his proceedings often nearly approaching that of Pepys himself. It is amusing to notice that, although perfectly satisfied with his outfit when he left the Färoes, a short sojourn in the Shetlands convinced him that he was far behind the fashion ; in Orkney he felt still more uncomfortable as to his clothes ; and when Aberdeen was reached he was only deterred from at once ordering a new and complete set of garments by the conviction that by waiting until he reached Edinburgh he would not only get the latest styles, but also the lowest charges. We hope that he was not disappointed. Travelling by mail-coach greatly astonished and affrighted him on account of the speed at which he was carried along ; but his railway journey from Arbroath to Dundee was pleasant and not at all alarming, although sixteen miles were covered in three-quarters of an hour, stoppages included ! It is impossible to follow our author in all his wanderings to Stirling, Edinburgh, Glasgow, Perth, etc., or to notice his adventures in search of the turf-pressing machine, which constantly evaded him like a will-o'-the-wisp, or his troubles in getting a vessel to carry the seed-potatoes to the Färoe Islands, troubles brought about not by the length and dangers of a voyage to an iron-bound and little-known coast, but by the monopoly of the Government which made it impossible to obtain a return cargo. For these and many other particulars our readers must go to the book itself, with the certainty of receiving both instruction and amusement. The translator has done excellent service in presenting to the English public such an interesting account of Scotland as it was half a century ago, and the publishers deserve a word of praise for the distinct print and neat get-up of the book, which is embellished by a curious portrait of the author. The original Danish edition is now very rare, though we understand that a copy was picked up somewhere in the Färoe Islands during last summer.

Kultur- und Reiseskizzen aus Nord- und Mittel-Amerika. Entworfen auf einer zum Studium der Zuckerindustrie unternommenen Reise von Dr. H. Paasche, Prof. der Staatswissenschaften, Mitgl. d. Reichstages u. des preuss. Landtages. Magdeburg : Albert Rathke, 1894. Pp. vi+553.

Most of these sketches are articles written for German newspapers during a journey to the U.S. of America, Mexico, the West Indies, and Venezuela. They refer more especially to the social and economic conditions, and the prospects of the countries mentioned. Although in the first place addressed to German readers, these observations, made by an intelligent and well-informed traveller, cannot fail to interest the British public. Speaking of the West Indies, our author advises England, instead of attempting to enlarge her African possessions, rather to see that her beautiful and valuable West Indian colonies do not pass—as they surely will if England does not wake up to the danger in time—into the hands of the Negroes. These brightly-written sketches may not contain much that is absolutely new, but they certainly form a volume of entertaining and instructive reading.

Vorgeschichte Nordamerika's im Gebiete der Vereinigten Staaten. Von Emil Schmidt. Mit 15 Abb., 4 Taf. u. 1 Karte. Braunschweig: Vieweg und Sohn, 1894. Pp. v+216.

This is an attempt to summarise in popular form the results of the latest researches regarding prehistoric man and his works in the U.S. of America. In the first chapter the author examines the evidence as to man's antiquity in the States. It appears that in the Sierra Nevada man may probably date as far back as the close of the Pliocene period. The second chapter deals with the copper implements and weapons of the prehistoric Indians, copper being the only metal known before the advent of Europeans. But the Indians fashioned copper like stone, not knowing the art of casting the metal, and as it did not serve to raise them above the level of the culture of the stone age, it would be clearly wrong to speak of a copper as distinguished from an iron age. In chapter iii. he discusses the mounds and other earthworks east of the Rocky Mountains, and tries to determine, aided by philology, the original seats of the historic Indians, whose ancestors were undoubtedly the mound-builders. The fourth and last chapter is devoted to the cliff-dwellers and prehistoric Pueblo Indians of the South-West, who likewise were the immediate ancestors of the historic tribes living in those regions. We can recommend the book as a trustworthy guide to all interested in American archæology and ethnography. It is well illustrated, and gives full references to the original publications of the investigators.

Camp-Fire Musings: Life and Good Times in the Woods. By Wm. C. Gray, Ph.D. Second Edition. 8vo. Edinburgh: David Douglas, 1894. Pp. 304. Illustrated.

Dr. Gray explains in his "apology" that many of the delightful spots (in Michigan, Florida, and other regions) where he pitched his camp will soon be cities, and he disarms criticism by asking us to take his book of impressions, not for its own value but as an expression of the love he has for a wild nature that is passing away. In a chatty fashion, pleasant perhaps in isolated papers, but a little wearisome in a book, he tells us of the pleasures of camping-out, of the beauty of the woods and lakes, of many a merry incident, and of his own religious and philosophical reflections. The whole must be taken kindly or not at all. Indeed, the moral seems to be that while it is a good thing to camp out, it is not a good thing to yield to partial friends who ask for a book of musings. But the author has the saving grace of humour, for he puts on his title-page—

"He who lives in Azam sends
This to worry all his friends."

Pages Détachées. Notes de Voyage. By Paul Claverie. Paris: Librairie Plon, 1894. Pp. 278.

In these pages M. Claverie pleasantly gives us some of his souvenirs of Senegal, the Straits of Magellan, Tahiti, the Marquesas Islands, and Central Oceania. It is interesting to compare his descriptions of Papeete and Tahiti with those of, say, R. L. Stevenson in *The Ebb-Tide.* Like him, M. Claverie writes of the music in Papeete: "Above the hubbub of traffic and the chatter of conversation in the street, grotesquely lit by the taverns' paper-lanterns, rises the sound of I know not what music, a screaming Chinese flute or a doleful accordion. And to-day I never hear the melancholy nasal notes of an accordion without seeing pass before me, as in a vision, all that eccentric quarter of Papeete where the acrid scent of opium

mingles with the perfumes of monoi and gardenias,—without imagining that I hear ascending from fragrant woods the grave and soft 'himenés' of Tahiti,—without beholding again the blue sea in deep grottoes of coral, the mountain with its fantastic peaks, the fresh shady valleys, the clear brooks in which we deliciously bathed; and again I seem to be surrounded by the joyous laughter and the gay voices of lovely, dark-haired women as they address me in that tongue so harmonious and so sweet, the language of Tahiti."

Old and New Paris. Its History, its People, and its Places. By H. Sutherland Edwards. Vol. ii. London: Cassell and Co., 1894. Pp. 376. *Price* 9*s.*

A further instalment of Mr. Edwards' fascinating and beautifully illustrated account of Paris. Some of the illustrations, all by French artists, are very curious; and some (such as the Sale-room of the Mont de Piété, or Government Pawn-office) are quite Zolaesque in their dreadful representation of humanity. All interested in the public works and institutions of a great municipality will find this volume very instructive,—schools, prisons, markets, lunatic asylums, pauper institutions, slaughter-houses, being passed under review and presented to us accompanied by illustrations full of graphic force and artistic ability.

Three Years with Lobengula and Experiences in South Africa. By J. Cooper-Chadwick. London: Cassell and Co., 1894. Pp. 160. Map and Portrait.

The author of this book had the misfortune to lose both his hands by a gun accident. This notwithstanding, he has been able to write a graphic account of his adventures in South Africa.

Whilst not of great geographical importance, the book gives a readable account of the habits and customs of the natives, and will be read with interest.

The map is good.

Walks in Palestine. By Henry A. Harper. Illustrated by fifteen photo-gravures from photographs taken by Cecil V. Shadbolt. London: Religious Tract Society, 1894.

This beautiful book first appeared in an *édition de luxe*, which was soon out of print. The reproduction does justice alike to Mr. Shadbolt's exquisite photographs of seventeen principal scenes in Palestine, and to Mr. Harper's sympathetic and cultured descriptions. As a member of the executive committee of the Palestine Exploration Fund, Mr. Harper has made himself an expert on the subject. The work is profoundly a photograph and memoir of Cecil V. Shadbolt, who died from injuries received in the Crystal Palace balloon accident in 1892.

The Colonisation of Indo-China. Translated from the French of J. Chailley-Bert by Arthur Baring Brabant. London: Archibald Constable and Co., 1894. Pp. xxiv + 389 + 12. *Price* 7*s.* 6*d.*

The original work was reviewed in vol. viii. p. 504. Though chiefly intended to teach his fellow-countrymen how colonisation should be carried out, M. Chailley-Bert's work is of interest to British readers as a brief account of British work in Indo-China. The translator gives on the whole the meaning of the author with accuracy, though occasionally a word might have been chosen more nearly equivalent to the French, and one or two expressions are hardly English—for instance, we should not say of rivers that they "afforded an inaccurate opinion" (p. 150).

Chin-Chin; or, The Chinaman at Home. By Tcheng-Ki-Tong. Translated by R. H. Sherard. London: A. P. Marsden, 1895. Pp. xii + 270. *Price* 3*s.* 6*d.*

This book is exceedingly interesting to any one who cares to know about the amusements, the fêtes and festivals, and the private life of the Chinese. It describes and explains many of their peculiar customs with a clearness seldom found in books on China. We must, however, take exception to some of the statements. The writer says, *à propos* of tea-drinking, "Europeans, and especially the English, do not know how to make tea. In the first place, *they boil it*; secondly, *they add strong spirits*, which destroy the taste." At page 205 the writer declares that he has "never *seen* or *heard* of any one who ate cat or dog;" and at page 178, that "wine was first manufactured in China *22,000 years* B.C.!"

Lovedale, South Africa. Illustrated by Fifty Views from Photographs. With Introduction by James Stewart, D.D., M.D., Hon. F.R.G.S. Edinburgh: Andrew Elliot. Glasgow: David Bryce and Son, 1894. Pp. viii + 110.

This exceptionally fine album is, we learn, a cheap edition of a still more sumptuous work, and is destined, we feel assured, to be warmly welcomed by all those—and they are many—interested in African missions. Dr. Stewart believes that, as this is an age of illustrations, something more than mere letter-press is now needed to arouse attention to subjects such as are here treated of. Doubtless he is right; and we are certain that the publication of this volume will do much to yet further stir the still growing interest displayed in the civilisation of the Negro. The illustrations include not only views of landscapes and buildings, but also scenes in the fields, the workshops, and the seminary, with class groups of students and teachers, and of the natives at home. The pages have wide margins, the paper is excellent, and the type such as we look for from the Constables' press.

Parry's Third Voyage for the Discovery of a North-West Passage in the years 1824 *and* 1825*: With an Account of the Esquimaux.* Edited from Parry's First Edition of his Voyage. With a Biographical Introduction. London: Blackie and Son, 1894. Pp. vii + 232. *Price* 1*s.* 4*d.*

This is a volume of Messrs. Blackie's "School and Home Library," which is specially intended for young people, and comprises books both interesting and instructive. The biographical sketch is, perhaps, rather too short, and a simple map in black and white, showing the route of the *Fury* and *Hecla*, seems to us almost indispensable.

Pomona's Travels. By Frank R. Stockton. Illustrated by A. B. Frost. London: Cassell and Co., N.D. Pp. xi + 275.

These *Travels* have nothing to do with geography. The book is a humorous sketch, and in many parts is decidedly amusing. The illustrations are spirited and well reproduced.

On Preservation of Health in India. By Sir J. Fayrer, K.C.S.I., M.D., F.R.S. London: Macmillan and Co., 1894. Pp. 51.

This small book, by a distinguished author, is well adapted for its purpose, namely, to give some idea of the Indian climate to young people going to India for the first time, and also to give them some simple but important rules as to diet and mode of life generally.

The various diseases so common in the tropics are mentioned and "first aid" advised. It is very brief, almost too brief; hardly a superfluous word will be found in it, and it really contains more information than its size would lead one to expect.

We can cordially recommend the book.

Theophrastus of Eresus on Winds and on Weather Signs. Translated by Jas. G. Wood, M.A., LL.B., F.G.S., and edited by G. J. Symons, F.R.S. Pp. 97.

Although there is little of scientific interest in this book, the subject-matter is a valuable contribution to pre-instrumental meteorology, and reflects much credit on the translator. The first half of the work is taken up with a dissertation "On Winds," which, needless to say, differs materially from modern memoirs on atmospheric circulation. The various phenomena are explained by the most absurd and paradoxical assertions, a few, however, containing an element of truth.

The second portion of the book is devoted to a collection of interesting and unique weather proverbs, many of which are of the most grotesque description. For example, it is said, "An ox resting on his left thigh indicates fair weather, and a dog likewise, but lying on the right indicates a storm." Again, "Comets generally indicate wind. If there are many they indicate drought also." The connection between atmospheric and sun-spot phenomena is foreshadowed by "Black spots on the sun and moon indicate rain"; and it is interesting to note that the supposed relation between the lunar orb and the weather was given credence to more than 2000 years ago.

The work is nicely printed, and is illustrated by several maps and two excellent photographs—one of the Horologium of Andronikos, the other being a copy of the "Table of the Winds" at the Vatican, supplied by the kindness of the late Rev. Padre Denza.

Das Schweizerische Dreiecknetz. Herausgegeben von der Schweizerischen Geodätischen Commission. Sechster Band. *Lotabweichungen in der Westschweiz.* Im Auftrage bearbeitet von Dr. J. B. Messerschmitt. Zürich: Commissionsverlag von Fäsi und Beer, 1894. Pp. 200.

The great importance of observations of the deviation of the plumb-line for the determination of the geoid, and the valuable results obtained in the basin of the Ticino, induced the Swiss Geodetic Commission to institute another series of observations in West Switzerland. In this volume a full account is given of the whole work. The instruments are described and the determination of their errors, and all the calculations for the determination of the altitude of the Pole and the azimuths at the stations chosen, etc. Finally, the deviations of the plumb-line are given in latitude, longitude, and zenithal distances and angles. The line of no deviation in latitude, where the attractions of the Alps and the Jura counterbalance each other, passes in a great curve along the lake of Geneva, and then, turning northwards, passes round the Freiburg Alps, and runs parallel to the Jura north of Payerne and Murten towards Zürich. Similarly, the deviations in longitude indicate a course parallel to the mountains, and the more powerful attraction of the Alps is seen to prevail over that of the Jura. All these details are clearly portrayed in the diagrams at the end of the volume. Interesting also is the deduction of the form of the geoid and its relation to the ellipsoid.

The Earth. By Evan W. Small, M.A., B.Sc. London: Methuen and Co., 1894. Pp. vii + 220. *Price* 2*s.* 6*d.*

To those for whom the work is intended this volume will certainly be most useful. As the elaborated notes of a lecturer on the subject the information is necessarily in a very concise form; yet always is there clearness and usually not a little interest. Beginning with the Earth as a planet, its form and movements are first considered, these leading to the laws of motion and of gravitation, and then to the consequences of the Earth's rotation and revolution. The following chapter is occupied with a discussion of the materials of the Earth—the Earth's crust, atmosphere, and waters being successively considered. Then comes a chapter on Work and Energy, in which the importance of having a clear notion of energy is emphasised. The geological history of the Earth's crust is treated at some length, and is by no means the least interesting part of the work. The last chapter considers the evolution of the Earth, and has a very useful, though all too brief, section on Spectrum Analysis, which is not usually taken up in books of the kind. References are given at the end of each section to the works in which the various matters are treated at greater length, so that the reader can easily extend his information. For the benefit of teachers, a list of useful lantern slides has been added as an Appendix.

Results of Rain, River, and Evaporation Observations made in New South Wales during 1892, under the direction of H. C. Russell, B.A., C.M.G., F.R.S., Government Astronomer for New South Wales. Sydney: Charles Potter, Government Printer, 1893. Pp. xl + 163.

The year 1892 was the fourth in succession in which the rainfall of the colony exceeded the average. For the nineteen years ending 1892 the average was 25·22 inches, while the mean rainfall of the colony in 1892 was 27·10. (We suppose this is correct, though 28·24 is given in the Introduction, p. iii.) The records confirmed the rule already laid down, that the evaporation is in inverse proportion to the rainfall. In this volume tables are given of the rainfall, height, etc., of tides, rise and fall of rivers, etc., many of which data are repeated in graphic form on maps and diagrams. It is a valuable book of reference for the student of meteorology.

Cassell's New Geographical Readers. Third Book: *England*; Fourth Book: *Scotland and Ireland, Australasia, and British North America.* London: Cassell and Co., Limited, 1894. *Price* 1*s.* and 1*s.* 3*d.*

These *Geographical Readers* are adapted to the Education Code. They are very copiously illustrated, and are written in simple language.

Descriptive and Pictorial Guide to the Isle of Man, its Towns and Villages, Mountains and Valleys, Glens and Falls, and all its other charming Features. With Map and numerous Illustrations. London, New York, and Melbourne: Ward, Lock, and Bowden, Limited, n.d. Pp. li + 288. *Price* 1*s.*

All parts of the island are described fully in this *Guide*, and the history, traditions, and antiquities are noticed in sufficient detail for the tourist. The information regarding steamers, railways, hotels, etc., is all that can be desired. Visitors to the Isle of Man, now so numerous, will find the book a useful companion.

Australasian Bibliography. Catalogue of Books in the Free Public Library, Sydney, relating to or published in Australasia. Sydney: Charles Potter Government Printer, 1893.

This large volume contains a catalogue of the works in the Library, brought down to the year 1888, and, though not a complete bibliography of Australasia, will be of great service to the student, containing, as it does, the titles of nearly 8000 books and pamphlets. It consists of three parts, viz., a complete list of authors; a list of authors arranged under the different colonies; and a classified subject and title catalogue.

Hazell's Annual for 1895. *A Cyclopædic Record of Men and Topics of the Day.* Edited by W. Palmer, B.A. (Lond.). London: Hazell, Watson, and Viney, 1895.

Every year this useful *Annual* grows larger, and this seems almost inevitable, as new subjects are always cropping up, and the old ones have not always lost their interest. This difficulty, which applies particularly to biographical notices, might be in some measure obviated by referring to the back volumes. The article on "Geographical Progress" is a useful summary, but might have been a little fuller. To say that Antarctic exploration is "without a record of achievement" is not quite correct, seeing that the *Jason's* log has been published this year. The compiler has also been misled, probably by a letter published in a Turkestan journal, into giving the depth below sea-level of Lake Bodshaite as 980 feet instead of half that number of feet.

An Almanack for the Year of our Lord 1895. By Joseph Whitaker, F.S.A. London: Whitaker and Sons. Pp. 744.

The information contained in this volume is, to a large extent, such as can be set in a permanent form, and, therefore, we can generally find anything we want at about the same page in the new volume. A few new articles are added, and a map of the partition of Africa is given. It is a very useful work of reference.

Aarbog for Dansk Kulturhistorie. 1893, 1894. Udgiven af Poul Bjerge. Aarhus: Jydsk Forlagsforening, 1893 and 1894. Pp. 188 and 208. *Price 2 kr. each.*

This little annual still maintains the interest with which it started a few years ago. Its articles are indeed interesting in the best sense of the word, in that the pulse of human beings beats in them. All the same, they are based upon what scientific historians acknowledge to be the best kind of sources—personal knowledge and experience, and official records. These two parts contain papers which treat of folklore, and the social and economic and geographical conditions of certain parts of Denmark in the past, throwing much instructive light upon the lives of the peasantry. Thus they are of more importance to the historian than to the geographer.

Attrezzatura, Manovra delle Navi e Segnalazioni Marittime. Di Fortunato Imperato, Professore nel R. Istituto Nautico "Nino Bixio" di Piano di Sorrento. Milano: Ulrico Hoepli, 1894. Pp. xviii+360.

The *Manuali Hoepli* are exceedingly useful little books, and the present volume contains a large amount of information in a compact form. It deals with the rigging of vessels, the handling of vessels propelled by steam, sails, and oars, and the use of various kinds of signals, besides other minor details.

NEW MAPS.

WORLD.

WORLD, Physical Map of the ——, on Mercator's Projection. With a Handbook. 3 ft. 10 in. by 4 ft. 3 in. *Edinburgh and London: W. and A. K. Johnston.*

This is one of Messrs. Johnston's *Educational Series of Wall Maps*, some of which we have already noticed. The elevations of the land and the ocean depths are clearly shown by various colours and shades, and the ocean currents are also marked. The Humboldt current might, perhaps, have been more clearly shown to turn westward at Cape Blanco, a change of direction which has such a marked effect on the climate of the northern coast of Ecuador; and the oasis of Turfan, lying considerably below sea-level, is so remarkable that it deserves a spot of dark green. The *Handbook* is full of information regarding the main physical features of the earth. The following corrections may be suggested :—Mount Demavend, according to Herr Sven Hedin's determination from the readings of three boiling-point thermometers, is 17,925 feet; Mount Elias is 18,010 feet high, and is not the loftiest mountain in North America, an honour which belongs to Mount Logan, 19,500 feet; and, lastly, the Jub, after the journeys of Captains Dundas, Bottego and Ferrandi, and Prince Ruspoli, can hardly be called "a stream of which little is known." These, however, are small points, and the map and book are useful productions.

EUROPE.

ENGLAND AND WALES, Map of Canals and Navigable Rivers of——. By Lionel B. Wells, M.Inst.C.E., late Engineer to the River Weaver Navigation.

George Falkner and Sons, Manchester.

A very useful map, giving a large amount of information. The differences in thickness of the lines indicating canals of various capacities are not very easily distinguished. A list at the foot of the map gives the lengths of the canals and other waterways, and particulars as to their ownership. The same firm publishes a simple map of the seat of war in the East.

AFRICA.

DEUTSCH-OSTAFRIKA, Originalkarte des Nördlichen ——, für das Deutsche-Antisklaverei-Komite nach eigenen Aufnahmen und Ortsbestimmungen construirt von Dr. Oscar Baumann. Mit Benutzung der englischen Grenztriangulierung, der Originalaufnahmen von Dr. G. A. Fischer, Kapt. Spring und Leut. Werther, sowie unter Berücksichtigung aller vorhandenen Materialen bearbeitet und gezeichnet von Dr. Hassenstein. Massstab 1 : 600,000.

Petermanns Geogr. Mitteilungen, Ergänzungsheft No. 3, 1894.

In this map, representing the German territory from Tanga to the northern end of lake Tanganika, and from Kilimanjaro and the northern shore of the Victoria Nyanza to Tabora and Mpwapwa, we have the results, among others, of Dr. Baumann's latest journey, described in his *Durch Massailand zur Nilquelle.* Dr. Hassenstein gives in the text an exhaustive history of the exploration of the country. The basis for the construction of the map is supplied by Dr. Baumann's astronomical observations along his route from Tabora to Tanganika, and Captain Spring's observations at the German stations, revised by Dr. Ambronn. Usambara is drawn from Dr. Baumann's surveys in 1883, 1885, and 1886. Among the most important additions to our knowledge of the country are the discoveries of the lakes Eyassi, Ngorongoro, and Lgarya by Dr. Baumann; and of lake Hohenlohe by Lieut. Werther.

The Edinburgh Geographical Ins

J G Bartholomew

ROUTES TO CANADA
Canadian Pacific Railway thus
Steamer Routes thus
Hayes Peninsula
Parry Islands
GREENLAND
BAFFIN BAY
Davis Strait
Denmark Strait
Iceland
Reikjavik
Arctic Circle
Hudson Strait
HUDSON BAY
DOMINION OF CANADA
BRITISH COLUMBIA
NORTH WEST TERRITORY
NORTH EAST TERRITORY
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
LABRADOR
UNITED STATES
MEXICO
Gulf of Mexico
WEST INDIES
ATLANTIC OCEAN
NORTH PACIFIC OCEAN
BRITISH ISLES
FRANCE
SPAIN
MOROCCO
ALGERIA
Liverpool to Quebec 2650 miles
Glasgow to Quebec 2643 m.
Liverpool to Halifax 2315 miles
Liverpool 2483 miles
Liverpool to St. Johns 1980 miles
Glasgow to New York 2780 miles
Liverpool to New York 3090 miles
Liverpool to Port au Prince 3967 miles
Liverpool to Havana 4500 miles
Liverpool to Aspinwall 4500 miles
Liverpool to Havana 3910 miles
Port Churchill to Liverpool 2936 miles
Southampton to New Orleans via Havana 4800 miles
Southampton to St. Thomas 3622 miles
Southampton to St. Thomas 3622 miles to Aspinwall
Jan Mayen
Lofoden I.
Faroe I.
Shetland I.
Orkney I.
Bergen
Christiania
Stavanger
Trondhjem
Aberdeen
Glasgow
Edinburgh
North Sea
Liverpool
Dublin
Belfast
Amsterdam
Rotterdam
Hamburg
Berlin
Brussels
Cologne
Paris
Bordeaux
Lyons
Venice
Marseilles
Naples
Oporto
Lisbon
Madrid
Gibraltar
Algiers
Tunis
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Teneriffe
Mogador
C. Blanco
Sitka
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Portland
San Francisco
Chicago
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Philadelphia
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Washington
Quebec
Montreal
Ottawa
Halifax
St. John
Sable I.
Bermudas
Cuba
Havana
Jamaica
Mexico
Vera Cruz
Tampico
Yukon
Mackenzie
Athabasca
Peace
Saskatchewan
Red River
Lake Winnipeg
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Hudson Bay
James Bay
Labrador
Belle Isle
Davis Strait
Baffin Land
Melville Sound
Lancaster Sd.
Barrow Str.
Banks Strait
Boothia
Gulf of Boothia
Victoria Ld.
Banks Land
Pr. Albert Land
North Devon
Melville I.
Bathurst
Prince of Wales I.
Southampton I.
Baker L.
Chesterfield Inlet
Fort Simpson
Great Bear L.
Great Slave L.
Fort Churchill
Fort York
Nain
Hopedale
Godthaab
Holsteinborg
Julianehaab
C. Farewell
Reykjavik
Edmonton
Battleford
Calgary
Regina
Winnipeg
Duluth
St. Paul
Chicago
Detroit
Cleveland
Buffalo
Albany
Portland
Augusta
Quebec
Montreal
Ottawa
Toronto
Kingston
Belleville
Hamilton
Niagara
Sarnia
Thunder Bay
Port Arthur
Nipissing
Lake Temiscaming
Lake St. John
Gaspe
Prince Edward Island
Cape Breton I.
New Brunswick
Nova Scotia
Halifax
Sable I.
St. John
Newfoundland
Cape Race
Helena
Bismarck
Minneapolis
Milwaukee
Omaha
Cheyenne
Denver
Leadville
Salt Lake City
Boise City
Portland
San Francisco
Los Angeles
San Diego
Prescott
Yuma
El Paso
Santa Fe
Topeka
St. Louis
Cincinnati
Pittsburg
Nashville
Memphis
Little Rock
Shreveport
Vicksburg
Atlanta
Richmond
Newport News
Baltimore
Philadelphia
New York
Albany
Boston
Portland
Augusta
Wilmington
Charleston
Savannah
Montgomery
Mobile
Pensacola
New Orleans
Galveston
San Antonio
Houston
Austin
Corpus Christi
Brownsville
Matamoras
Monterey
Chihuahua
Mazatlan
Guaymas
Guadalajara
San Blas
Tampico
Vera Cruz
Campeachy
Yucatan
Havana
Cuba
Jamaica
Nassau
Bahamas
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St. Thomas
Porto Rico
Guadaloupe I.
Revilla Gigedo I.
Azores
Madeira
Canary I.
Teneriffe
Mogador
Morocco
Fez
Algiers
Tunis
Malta
Gibraltar
Cadiz
Tangier
Oran
Bona
Palermo
Naples
Marseilles
Nice
Genoa
Venice
Trieste
Corfu
Lisbon
Oporto
Vigo
Bilbao
Madrid
Saragossa
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Calais
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Ostend
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Brussels
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Coblentz
Mayence
Frankfort
Hamburg
Bremen
Amsterdam
Rotterdam
Flushing
Ghent
Liege
Namur
Luxemburg
Metz
Strasburg
Basle
Berne
Lucerne
Zurich
Innsbruck
Munich
Ratisbon
Nuremberg
Leipsic
Dresden
Berlin
Stettin
Dantzic
Konigsberg
Memel
Riga
Reval
St. Petersburg
Moscow
Archangel
Wardhuus
Hammerfest
Tromsoe
Alten
Christiansund
Molde
Trondhjem
Stavanger
Bergen
Christiania
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Gothenburg
Stockholm
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Wisby
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Elsinore
Odense
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Skagen
Esbjerg
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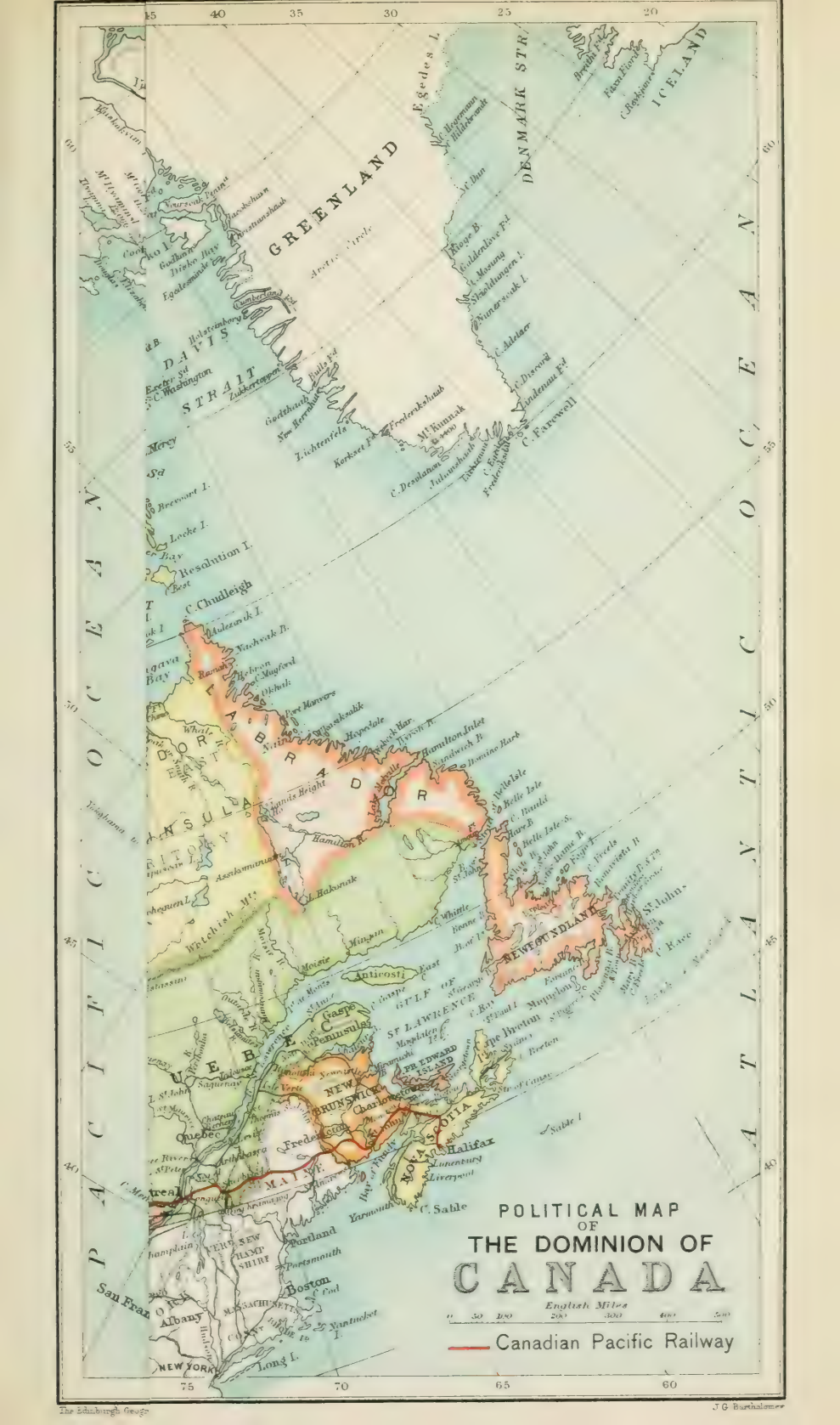
POLITICAL MAP
OF
THE DOMINION OF
CANADA
English Miles
0 50 100 200 300 400 500
Canadian Pacific Railway
GREENLAND
DENMARK STR.
ICELAND
DAVIS STRAIT
LABRADOR
NEWFOUNDLAND
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
P.E. ISLAND
MAINE
Quebec
Montreal
Halifax
Boston
NEW YORK
Albany
Portland
Ottawa
Fredericton
Charlottetown
Arctic Circle
PACIFIC OCEAN
ATLANTIC OCEAN
The Edinburgh Geogr.
J.G. Bartholomew

POLITICAL MAP
OF
THE DOMINION OF
CANADA
English Miles
Canadian Pacific Railway
PACIFIC OCEAN
ATLANTIC OCEAN
ALASKA
GREENLAND
ICELAND
DENMARK STR.
BAFFIN BAY
DAVIS STRAIT
HUDSON BAY
HUDSON STRAIT
LABRADOR
NORTH TERRITORY
BRITISH COLUMBIA
ATHABASCA
KEEWATIN
ASSINIBOIA
SASKATCHEWAN
ALBERTA
MANITOBA
MACKENZIE
JAMES BAY
QUEBEC
ONTARIO
NOVA SCOTIA
NEW BRUNSWICK
PRINCE EDWARD I.
NEWFOUNDLAND
UNITED STATES
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SOUTH DAKOTA
MINNESOTA
WISCONSIN
WYOMING
IDAHO
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Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Victoria
Vancouver Isl.
San Francisco
Chicago
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Prince Albert
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Port Simpson
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Fort Norman
Fort Good Hope
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Fort Anderson
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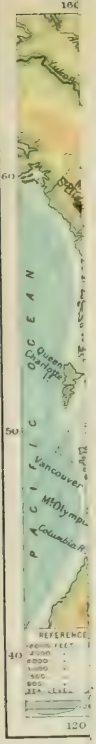
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REFERENCE
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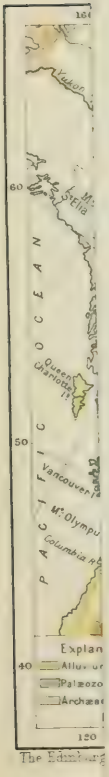
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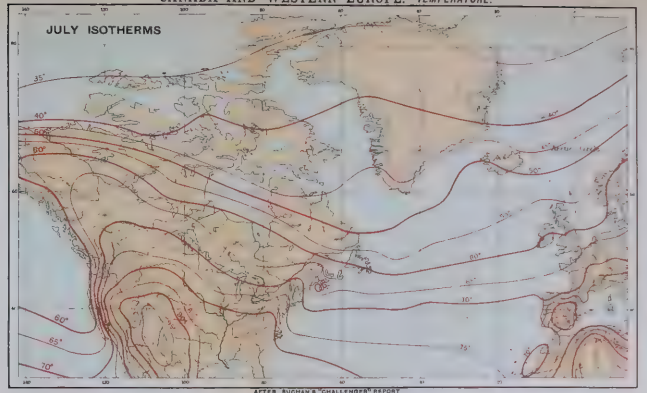
CANADA. *LAND SURFACE ELEVATION.*

CANADA. *LAND SURFACE FEATURES.*

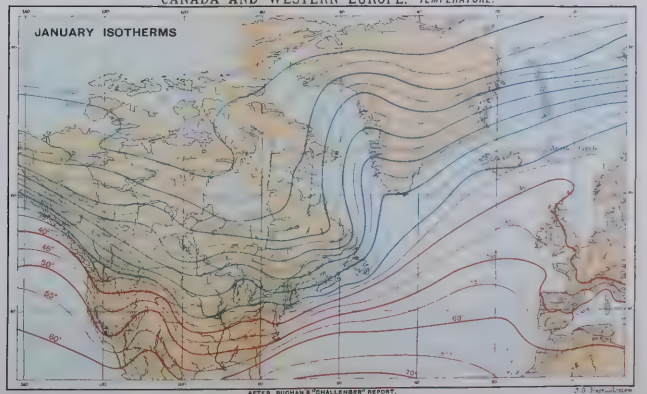
CANADA AND WESTERN EUROPE. *TEMPERATURE.*



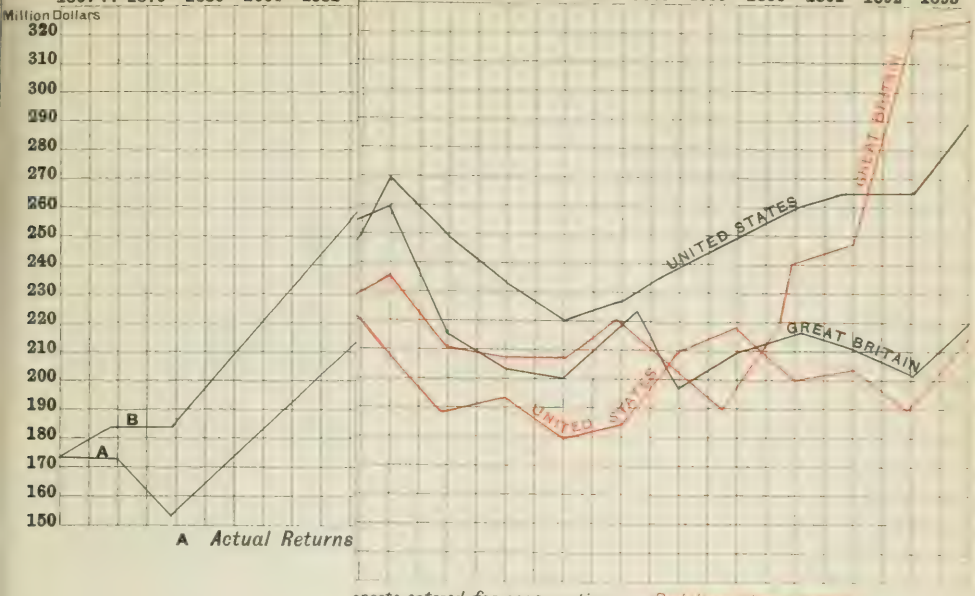
CANADA. *GEOLOGICAL FEATURES.*

CANADA. *MEAN ANNUAL RAINFALL.*

CANADA AND WESTERN EUROPE. *TEMPERATURE.*



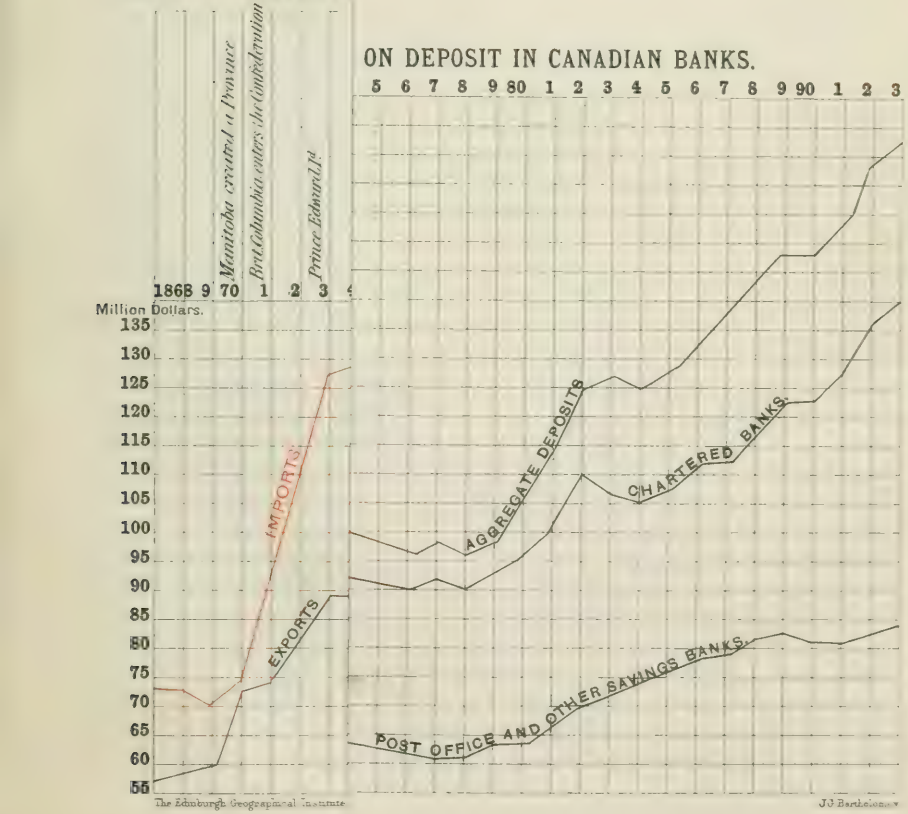
No. I. Under between GREAT BRITAIN AND THE UNITED STATES.



A Actual Returns

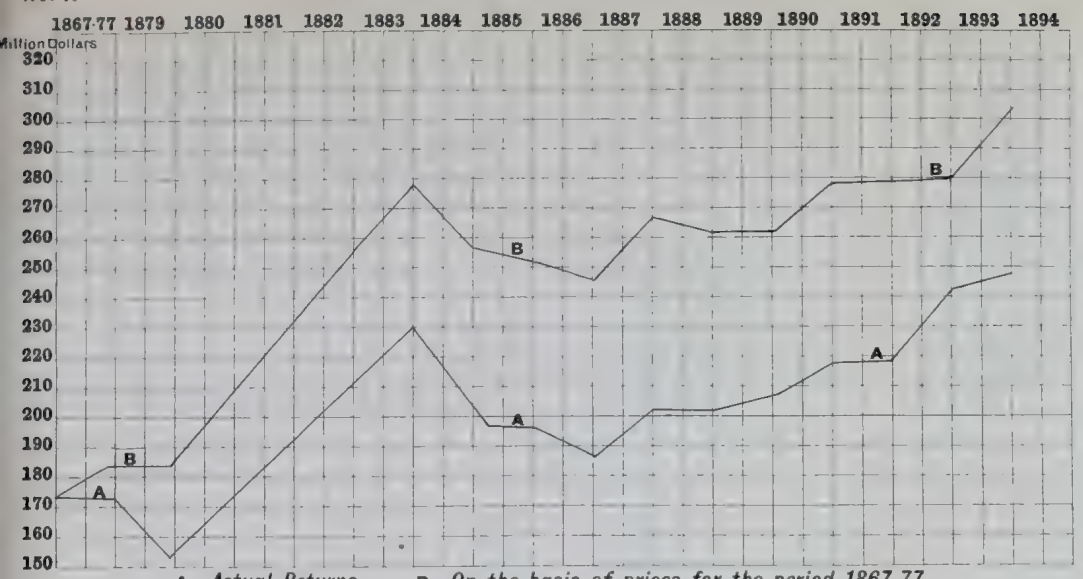
ports entered for consumption. Red lines show exports.

No. II. IMPORTS ON DEPOSIT IN CANADIAN BANKS.



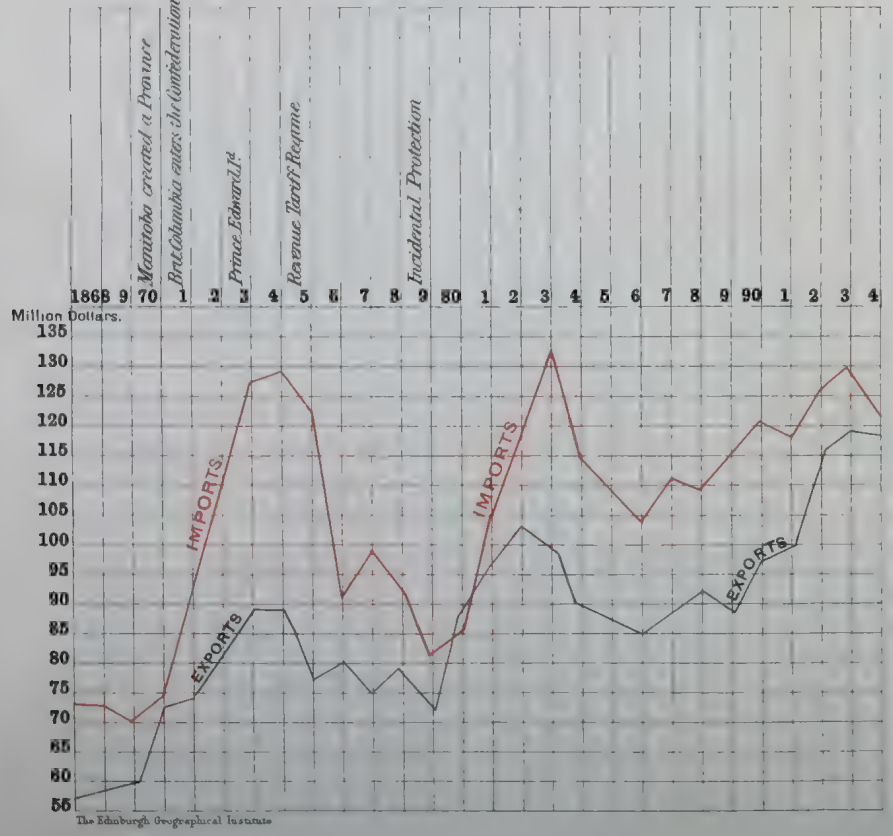
The Edinburgh Geographical Institute J.G. Bartholomew

No. I. AGGREGATE TRADE OF CANADA. Under Incidental Protection 1879-1894.

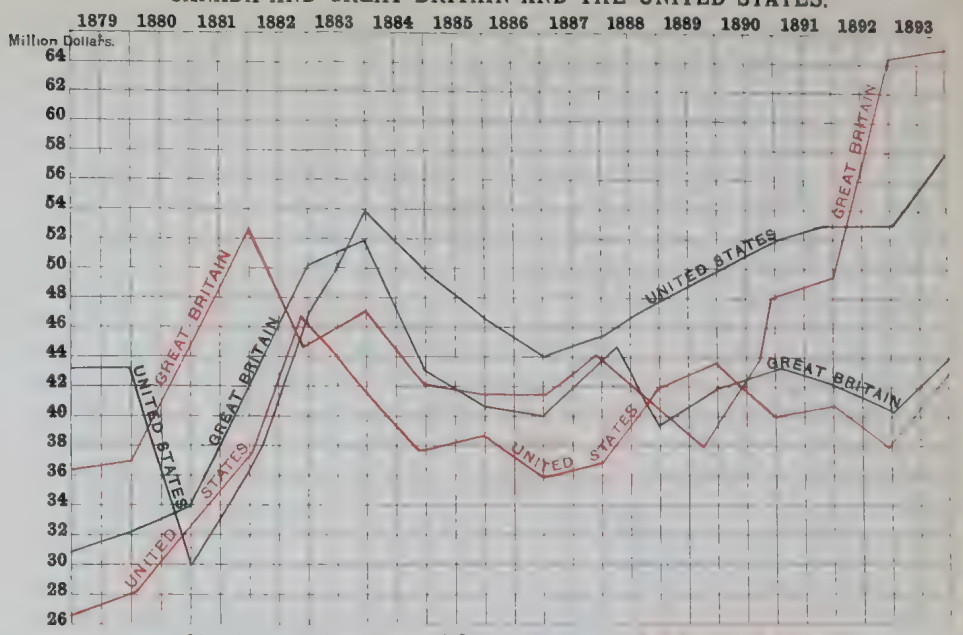


A *Actual Returns.* B *On the basis of prices for the period 1867-77.*

No. II. IMPORTS AND EXPORTS OF CANADA. 1867-1894.


Manitoba created a Province
Brit. Columbia enters the Confederation
Prince Edward Id.
Revenue Tariff Reforme
Incidental Protection
1868 9 70 1 2 3 4 5 6 7 8 9 80 1 2 3 4 5 6 7 8 9 90 1 2 3 4
Million Dollars.
135 130 125 120 115 110 105 100 95 90 85 80 75 70 65 60 55
IMPORTS.
EXPORTS
IMPORTS
EXPORTS
The Edinburgh Geographical Institute

Trade Exchanges between No. III. CANADA AND GREAT BRITAIN AND THE UNITED STATES.


1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893
Million Dollars.
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GREAT BRITAIN
UNITED STATES
GREAT BRITAIN
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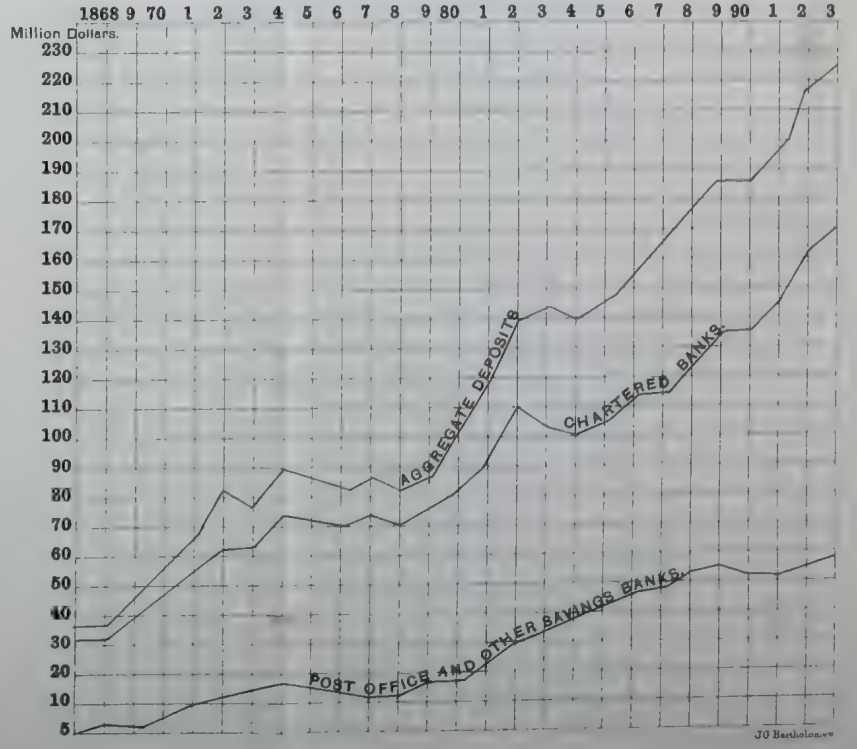
GREAT BRITAIN

Black lines show imports entered for consumption. *Red lines show exports.*

No. IV. MONEY ON DEPOSIT IN CANADIAN BANKS.



THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE GEOGRAPHICAL WORK OF THE FUTURE.

By Hugh Robert Mill, D.Sc., F.R.S.E.

(*Abstract of a Lecture delivered to the Society in Edinburgh, December* 1894.)

Geography, although usually defined as the description of the surface of the Earth, includes much more than description. Exploration and research are necessary before description becomes possible, and the history of geography is frequently treated as if synonymous with the history of discovery. Another well-known definition—Geography is the science of distributions—includes all aspects of geography, and suggests the best ways and the most suitable means for geographical advance in every direction. This definition includes within the sphere of geography everything which may be shown on a map. Thus, as everything which is capable of being written may be said to be in some sense literature, so everything which is capable of cartographic representation may be said to be geography.

As in all science, the first essentials of geography are definiteness and accuracy, both in observation and expression. Preconceived ideas and vague guesses are even more prejudicial to geography than to other branches of science, because they are not always easily traceable in the descriptions, to which they may lend a false air of reality. Taking geography as the study of all that can be cartographically represented, the fundamental requisite is an accurate skeleton-map on which distributions can be shown; and the basis of such a map is exact surveying. The degree of accuracy necessary depends upon the character of the area represented and the scale on which it is shown. In small-scale maps of the World the thickness of the lines usually conceals the errors of position, so that there is some excuse for the firmness of detail which appears in an ordinary atlas.

The growth of a complete and accurate map of the topography of the Earth's surface has been gradual and slow. In the early days of groping after the first rough sketch of a cosmography, theory inevitably predominated over observation, and explorers were often put to much trouble in order to prove the probable falsity of ill-grounded conjectures, which held the public mind, before they could secure an opportunity for making discoveries.

Many motives have been powerful in leading to exploration. The most imperative has been a change in the physical conditions of a country which compelled the inhabitants to move elsewhere in order to find the means of life, or a similar stringency of conditions artificially produced which compelled people to find new homes to protect their liberty. Such movements of tribes or parties I have termed centrifugal migrations; the people who took part in them were explorers by compulsion. Most searchers for and into new lands are, however, explorers by attraction; and most migrations to new lands may be called centripetal, being directed towards certain desirable regions. The nature of the attraction may be territorial ambition, as in the case of the Mongol Emperors, of Alexander, and of many modern colonising expeditions; or it may be, and most frequently has been, commercial advantage; the opening up of new fields of supply, or, latterly, new markets, has drawn many expeditions into the field. The search for a waterway from Europe to China and India for trade purposes was the motive of the greatest period of maritime discovery which the world has known, in which the discovery of America was an incident. Two other motives have had much influence. Missionary explorers have done great things in opening up unknown lands, and the discoveries of the Buddhist priests in Asia and the Malay archipelago, of the Mohammedans in Africa, and of Christian missionaries, especially the earlier Jesuits, in all parts of the world, are of great importance. The last incentive is scientific research, and this is now the most important, as nearly all the commercially valuable lands are in course of being taken in hand by traders and chartered companies, and missionaries have penetrated into almost every inhabited country. The great unexplored tracts now are uninhabited wastes of ice or sand, or the bed of the oceans, in which scientific investigators alone take an active interest.

Against the motives toward exploration there are various resistances at work; and, speaking generally, the present state of our knowledge of the globe may be said to be a balance between inducement and resistance, and future work in this direction must depend on an increase of inducement or a diminution of resistance. In some places, as in the Central Sudan, the strongest inducements have failed to overcome the determined resistance of the natives to the admission of civilised traders; in every case the unknown regions are areas of very high resistance to penetration.

In the case of Africa, the relative inducements and resistances of different parts of the continent have been made the subject of effective cartographic treatment by Mr. A. Silva White.[1]

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[1] *Scottish Geographical Magazine*, vol. vii. (1891), p. 191.

Knowledge or ignorance in geography, as in other departments, being a thing of degree, it becomes necessary to fix upon some scale by which the amount of our knowledge of the land may be measured. In the case of simple topography the accuracy of the best existing maps furnishes a trustworthy guide, and this subject has been comprehensively dealt with for each continent by Mr. J. G. Bartholomew.[1]

Only the British Islands, France, Germany, Switzerland, and parts of the other countries of Western Europe, Algeria, Egypt, Palestine, India, and a small percentage of the area of the United States, have been mapped with high precision. Most of the continental coast-lines are approximately known, but the true longitude of few places has been ascertained outside the carefully surveyed regions, or remote from an astronomical observatory.

The absolutely unknown lands, of which it is impossible to make any kind of map, comprise the greater part of the bed of the oceans, the Polar regions, and patches of land in the heart of each continent (except Europe), and in many of the larger islands. In these areas much geographical work of the fundamental sort may still be done by the rough processes of the pioneer; but with the perfection of photographic methods of surveying it seems probable that maps of these regions, when entered, may become at a single stride better than those of tracts of country which have been open to travellers for ages.

In Africa the totally unknown regions are restricted to the most arid parts of the Sahara, including the great Tibesti range and the Libyan desert, an area in the centre of Somali-land, and a few places in the Central Sudan and in the Congo basin.

In Asia the interior of Arabia remains unknown, for like the Sahara it presents resistances to penetration far more powerful than the inducements it offers. The higher regions of the Himalayas, though now topographically mapped, still remain unvisited; and of large stretches of Tibet and Central Asia the maps are blank or very vague. The great islands of Borneo and New Guinea contain unknown lands of vast extent, and so does the central desert-region of Australia.

In America there is no complete survey of the Amazon basin, or of hundreds of thousands of square miles of the "barren ground" of northern Canada.

But of all unknown areas the most extensive, and those offering the highest resistance to penetration, surround the Poles. The North Polar area which remains absolutely unknown—pending news from the expeditions now endeavouring to cross it—is a ragged quadrilateral large enough, if it were projected on the map of Europe, to extend from beyond the Faröe Islands to the Adriatic, and from the Channel Islands to the Gulf of Finland. The unknown South Polar region is as large as the whole of Europe even when its area is restricted by gathering into the known world all the surface down to the farthest southerly point attained by each Antarctic voyager. The sketch map, Fig. 1, shows graphically, by the projection of the unknown areas on Europe, how much geographical

[1] *Scottish Geographical Magazine*, vol. vi. (1890), pp. 293, 575; vol. vii. (1891), pp. 124, 586.

discovery in the old sense of the word remains to be done; and it is not creditable to geographical science that the nineteenth century may close and leave them undiminished. The motive force that must overcome the resistances interposed in these cases is purely scientific enthusiasm; the difficulties are too great to allow the mere love of adventure or

FIG. 1.—THE UNKNOWN POLAR REGIONS.

Note.—The inner dotted line encloses an area equal to the unexplored North Polar Regions. The outer dotted line encloses an area equal to the unexplored South Polar Regions.

personal vanity to drive any one to either Pole. The scientific advantages to be gained from the exploration of the Polar regions are so great and obvious that it would be absurd to urge them upon the attention of geographical readers. The full exposition of the subject given last year by Dr. John Murray[1] is not likely to remain without result. The matter has been taken up by the Royal Geographical Society with a determination which is not likely to be thwarted; and most, if not all, of the other geographical and scientific societies of the British Empire will probably co-operate in the endeavour to procure the despatch of a Government

[1] *Geographical Journal*, vol. iii. (1894), p. 1.

expedition on a large scale to continue the researches in the Antarctic regions, dropped fifty years ago after the return of Sir J. C. Ross. The substantial additions to our knowledge by the Norwegian whaler *Jason* last year show that a great deal can be done in a small vessel with an inexpensive crew, when under the command of an enlightened and enterprising captain. There is room enough for private enterprise in this quarter, and a rich reward of discovery is certainly waiting within reach. Nothing can, however, be done by rash adventurers ignorant of the risks they run, and untrained to habits of self-denial and hard, systematic work. It is unfortunate that the schemes of such men should be encouraged by the good-natured sympathy of an uncritical public, willing to applaud pluck and enthusiasm without taking the trouble to form a careful opinion.

So far I have referred merely to simple topography—in other words, to the fixing of the position of points and lines on the surface of the globe; but geography consists of more than the mathematical element, and the future work of geographers must occupy a largely different field. In endeavouring to subdivide the content of geography in such a

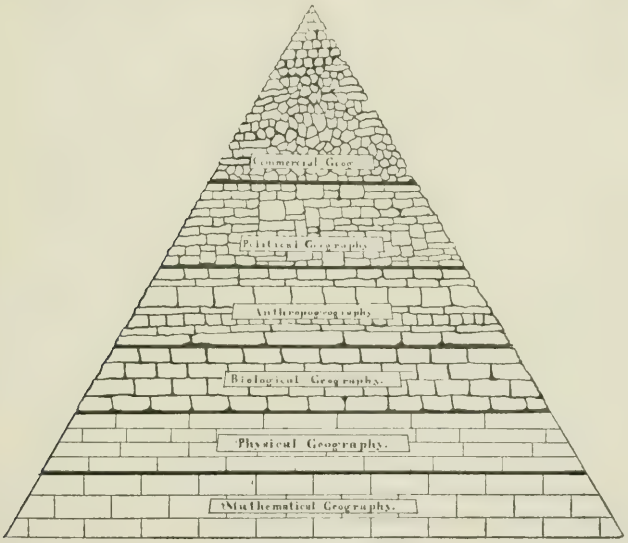

FIG. 2.—THE DEPARTMENTS OF GEOGRAPHY.

way as to bring out the natural interrelations of its parts and their logical sequence, for purposes of exhaustive study, it has occurred to me to represent the whole metaphorically by a pyramid (Fig. 2) of several courses of masonry differing in material and finish, but each supported by those below and supporting those above.[1] Thus the fundamental course would

[1] I have used this system of subdivision for some years in lectures, and published a short summary of it in the American journal *Science*, for January 12, 1894. The diagram itself has not been published before.

be Mathematical Geography, constructed of great blocks hewn from the quarries of the only absolute science, accurately squared and fitted. It includes all that has to do with exact measurement of space and time and motion, the form and dimensions of the Earth, its motions, and the construction of maps. Upon this base is reared the second tier, Physical Geography, the material for which, less homogeneous and perfect than the foregoing, comes from quarries scattered over the realms of many sciences—chemistry, physics, and the different departments of geology, meteorology, and oceanography. It is concerned with all those phenomena which depend on differences of substance, structure, and state, and accounts for the origin of surface-features and of scenery, the interactions of lithosphere, hydrosphere, and atmosphere, and the effect on each of solar energy. Next in order and less regular in structure, dependent on physical geography as physical is on mathematical, comes Bio-Geography, wherein the influence of life is taken into account. This serves to explain how the vital processes of organisms affect the structure of the Earth, and how the lifeless features of the globe regulate the distribution of vegetation and of animals. Arising directly from this floor, but as yet only imperfectly put together, is the course of Anthropo-Geography, the elucidation of the action of mankind as an animal species upon the globe. The unit of consideration is mankind as a whole; the variety of races, and life-conditions and density of population, are the features taken into account, and the interaction between man and nature has to be studied in its widest aspects. The changes in the relation of different tribes to their habitat belong to this zone, and these changes are the basis of historical geography, which forms the beginning of the next tier of the pyramid, in which the influence of races of men on the Earth finds a place. This may be termed, for lack of a better name, Political Geography; its units are uncertain and transitory, for the hold of nations on regions is subject to continual change. But political geography is stability itself compared with the rough pile of Commercial Geography which caps, if it does not crown, the edifice. Here it is no longer the racial or national view-point which determines the conditions, but the individual. The distribution of natural resources is the fundamental condition, and the natural frontier has rarely much in common with the political.

But here a further simile must be brought in. This cap of the pyramid plays the part of a keystone as well, and binds the whole structure together. As rain filtering through a mass of brick or stonework dissolves the mortar of the upper parts, and redeposits it in the lower courses, so the stream of self-interest permeates the whole structure of geography, and its results are felt throughout. Commercial motives consolidate national life, accentuate racial differences, redistribute animals and plants, modify physical conditions, start investigations into the nature of the Earth, and even invade the solid groundwork of mathematics with the practical counsels of common-sense.

On the foundation of mathematical geography, which supplies a correct topography, the various tiers of physical geography must be built. For this the first essential is a correct relief of the land, or rather of the surface of the lithosphere, which in large measure explains the topography

by giving meaning to the drainage lines and the arid basins whence there is no escape for the entering water. On this again the geological structure must be superimposed—not that geographers require to make geological observations, but they require to use them in order to fully appreciate the bearing of the land upon dependent distributions. Soil-maps as well as rock-maps are of great importance. Then climatic phenomena, when ascertained by the meteorologist, have to be laid down on charts, and their dependence on relief and on drainage duly noted. Here also the dynamic element of geography comes in, for the discussion of land-forms and climate reveals the whole process of the evolution of land-surface features, and affords ground for such generalisations as Professor W. M. Davis [1] applies to the geographical cycle actuated by elevation and erosion, or to Professor Penck's [2] classification. Next, from the zoologist and botanist the data for charting the distribution of life as to kind and abundance both in surface and in altitude have to be sought, and the world thus known becomes at once a more complicated and a simpler whole: more complicated in dealing with more numerous facts, simpler by suggesting the harmonious interaction of different orders of phenomena to secure definite results. The transition upwards is easy into anthropo-geography, in which man is first considered as an animal in relation to the Earth, and later the Earth is considered in relation to man. This, the most interesting and complex aspect of geography, must be taken in detail. The distributions with which it deals are, first, the aggregation of people such as would be shown in a true map of density of population, the explanation of which would be found to some extent in the relief of the land and in the character of the climate and soil. Such a map is obviously true only for a limited time. It shows the result of migrations up to the moment of compilation, and is the geographical expression of the fundamental datum of census returns; just as a hypsometrical map shows the result of all previous surface changes. But as the geological map explains and amplifies the hypsometrical, so the map of density of population must be amplified and elucidated by charting the distribution of different races, and the variations in language, religion, etc., which have been observed. Further, the political partition of the land has to be considered, and here variations are so frequent that maps rapidly pass out of date. Such political maps were the first to be brought to a state approaching perfection, and the word *map* naturally calls to the mind a map of this description, which is the least instructive of all possible maps, although of great practical value. The "political" map is almost always a route-map as well, showing roads or railways and navigable waters, thus approximating to the representation of the most fugitive of distributions dealt with in geography—the commercial value of the Earth's surface as determined by natural productions of economic value, populations distinguished as producers and consumers, and means of communication and transport in all directions. Such a commercial map, if it could be produced, would involve every one of the more per-

[1] *Journal of Geology*, vol. ii. (1894), p. 66.
[2] *Morphologie der Erdoberfläche*, 2 vols., Stuttgart, 1894.

manent aspects of geography variously combined. The new agronomic maps of parts of France make the facts of the geological surveys available directly for agricultural purposes, and so form a step towards the ideal economic or commercial map.

My contention is that the future work of geographers must lie more in the discussion and co-ordination of different classes of phenomena as regards their distribution and interaction, than in the simple effort to produce a topographical map of high accuracy. The study of geography must thus increasingly demand a practical acquaintance with many sciences and modes of thought and expression, not for the purpose of carrying on researches in these sciences, but with the object of collecting their results and applying them to the elucidation of the Earth, viewed as the present expression of a definite evolution in which every part is subordinated to the production of a suitable home and sphere of influence for civilised man.

Viewed in this way, geography may be employed as a mental discipline in education in no whit inferior to other better-recognised gymnastics, and more likely than most to lead attentive students to results of practical value. Much remains to be done before existing data have been digested and utilised. That the geographical turn of mind is not necessarily material in its conception of the world it studies, may be readily proved by reference to the works of almost any modern poet. And no more beautiful instance could be afforded of its literary fruitfulness than Mr. R. L. Stevenson's description of how he built up his romance of *Treasure Island* from the basis of a map.[1]

THE MORPHOLOGY OF THE EARTH'S SURFACE.

THE surface-features of the Earth and their origin is a subject which, ever since the days of Hutton and Playfair, has claimed the attention of geologists, although it is only within the last thirty or forty years that it has come prominently to the front. The irregularities of the land—mountains and valleys—were for a long time supposed to owe their origin directly to the action of the mysterious subterranean forces, and the great part played by running water in corroding and furrowing the surface of the land was hardly recognised until after the appearance of Hutton's famous *Theory of the Earth*, and Playfair's well-known *Illustrations*. Eventually it was realised by geologists generally that both hypogene and epigene agents have been concerned in the production of the Earth's surface-features. This is the view which presently prevails,

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[1] The melancholy news of Mr. Stevenson's death reached Edinburgh only a few days after this lecture was delivered. Not alone in *Treasure Island*, but in almost all his stories and essays, geographical ideas find fit and graceful expression, and the world has lost a geographer while it mourns for a poet.

and which Professor Penck, in the masterly treatise named below,[1] sets forth with admirable lucidity. It is impossible, within the scope of a short article, to present anything like a complete analysis of this extensive and learned work. Needless to say, it is crowded with detail—the pages overflowing with references to the literature of the subject. It is, in short, a treasure-house of facts, and as such will be welcomed by geographers and geologists alike. Although the work contains references to the views of almost every writer who has discussed the character and origin of surface-features, it is far from being a mere cento of others' opinions. Throughout, the author deals with his subject in a thoroughly independent manner, and wins our attention not less by the admirable way in which his facts are grouped, than by the clearness with which he works out his conclusions.

Dealing first with the general morphology of the Earth, he treats in succession of the form and size of the globe, of geographical co-ordinates, of the methods of delineating and measuring the surface, and other mathematical-geographical questions. Thereafter the larger features of the earth are considered—the author concluding this preliminary section of his work with an instructive discussion of the question of the permanence of abyssal and continental areas.

Book II., which necessarily constitutes the large portion of the work, treats first of the general features of the land—the geological structure of the crust, and the origin of its manifold configuration. Starting from the point of view that the existing surface-features have resulted from the working of two sets of agents—one acting upon the surface from without, the other from within—the author proceeds to discuss the character and action of these exogenous and endogenous agents. This portion of Professor Penck's monograph may be said to traverse the same ground as Lyell's *Principles of Geology*. It is, in short, an elaborate discussion of what is known as Dynamical Geology. His treatment of the subject, however, is necessarily more advanced than Lyell's, and in many respects more detailed and comprehensive than the corresponding discussion in the larger textbooks of geology. The disintegration and transformation of rocks and rock-materials—the movements of masses, as in landslips, etc.—and the continuous degradation or wearing-away of the surface under the chemical and mechanical action of rain, frost, etc., are all brought vividly before us. Not less admirable is the account of the action of the wind in transporting disintegrated materials, and in wearing away the rock-surfaces over which such materials are swept. The action of running water and of ice next comes in for consideration, and we have an excellent account of the great work of erosion and accumulation performed by rivers and by glaciers. Under the head of "Modern Denudation," the author passes in review the various estimates of the rate at which the land-surface is being lowered. These estimates have been based on measurements of the amount of materials which are carried seaward by rivers. The annual discharge of material by any given river

[1] *Morphologie der Erdoberfläche*, von Dr. Albrecht Penck. 2 vols., pp. 471, 696. Stuttgart: J. Engelhorn, 1894.

having been ascertained, we know that its drainage-area has suffered just so much loss. As might have been expected, the rate of erosion thus measured varies considerably—some rivers carrying very much more sediment than others. Thus the amount of solid and dissolved material transported seaward annually by the rivers Elbe, Rhine, Meuse, Seine and Marne, and Thames, if we suppose it to have been taken equally from all parts of the land, indicates a general lowering of the surface of Middle Europe at the rate of 1 mètre in 32,900 years. The Rhone and the Danube, on the other hand, lower their drainage-areas to the same extent in 14,400 years. Taking the amount of material discharged every year by all the rivers of the globe as equal at least to 20 cubic kilomètres, Penck estimates that this is equal to a layer 0·64 mm. in thickness removed from the regions of fluviatile erosion (about one-fourth of the entire land-area). This would imply that the rivers lower the land at the rate of 1 mètre in 1440 years.

The first section of Book II. concludes with a discussion of the endogenous processes which have influenced the configuration of the land-surface. The movements of the crust, as in earthquakes—the dislocations, deformations, and foldings which that crust has experienced—are first described; and thereafter we have an account of the movements of the "magma," as illustrated by modern volcanic action. This is followed by a discussion of the various hypotheses which have been held as to the condition of the Earth's interior. The cooling of the globe and its consequences are next considered—the movements of the crust and the magma being the necessary results of that cooling. As the crust sinks down upon the cooling and contracting interior, it is crushed, dislocated, and folded—the compressed magma intruding itself into the fissured and dislocated masses, and here and there forcing its way to the surface in volcanic eruptions. The cooling of the globe is not equal throughout—there is more loss of Earth-heat in the oceanic basin than over the land. The permanence of the oceanic and continental areas is thus a necessary result of this unequal cooling. Hence the Earth's crust naturally consists of two great regions:—(1.) The high-lying continental and low-lying abyssal regions, or relatively stable areas; and (2.) the zones of crust-folding, displacement, and volcanic action, or unstable areas. The stable regions are of enormous antiquity, and their origin is unknown—they were certainly in existence before the earliest fossiliferous strata came into existence. In the unstable zones, where the crust is subject to energetic movement, the adjacent sea-floor is now and again pushed up and added to the land, while, on the other hand, coastal areas are ever and anon carried down under the sea. Professor Penck concludes this portion of his work by a discussion of other suggested causes for crustal movements, such as the influence exerted by the increase and decrease of great ice-sheets, and by the removal of sedimentary materials from one region and their accumulation elsewhere.

The second section of Book II. contains an elaborate description of the various surface-features of the land, and an inquiry into their origin. It is impossible in a short notice to convey any adequate idea of the author's treatment of this part of his subject. Beginning with the

simpler forms, he gives some account of the approximately level or gently undulating areas known as Plains—some of which owe their origin to erosion, while the larger number are simply the result of sedimentation. Next are described those rapidly undulating tracts—such as regions of sand-dunes—which, like most plains, have originated from transport and accumulation. Under the same head are included morainic regions, such as the *paysage morainique* of the Baltic ridge, and of many other formerly glaciated tracts, in which we find certain well-marked types of hills and hillocks of accumulation, such as end-moraines, drumlins, osar or eskers, and kames. Again, under the same category of "hills of accumulation" come the so-called mud-volcanos of such regions as Baku, and the "mud-lumps" of the deltas of large rivers like the Mississippi and the Indus. Next follows a long chapter on valleys, in which, after describing their various forms, their systems, and geographical distribution, he discusses their origin—coming to the general conclusion that valleys have been formed by the erosive action of running water. He points out, however, that the direction taken by streams and rivers has in many cases been determined by pre-existing depressions in the surface. Some rivers, for example, flow along the bottoms of structural hollows or synclinal troughs, as geologists term them, while others follow lines of dislocations. Again, volcanic action has occasionally produced great valley-like depressions, as in the Valle del Bove of Ætna. The irregular heaping-up of materials upon the land-surface has also originated valleys, as in the case of the hollows that separate adjacent lava-flows. Then we have long and often gully-like valleys produced by the falling-in of the roofs of underground channels; while other depressions of the surface have resulted from the erosive action of wind and of glaciers. Most of these hollows, however, differ from true river-valleys in their relatively short extent, their rectilinear direction, and more or less sporadic occurrence: they do not group themselves into manifold branching systems, and in many other respects offer strong contrasts to valleys which have been hollowed out by rivers. Reference may be made, in passing, to Professor Penck's discussion of the phenomenon of valley-within-valley. This is seen in many regions. In the valleys of the Eastern Alps, for example, three successive gravel-terraces are encountered—one within the other—indicating three successive levels at which the rivers were active in accumulating their alluvia. Each terrace is associated with moraines, and belongs, therefore, to a glacial epoch, during which the rivers swept forward a superabundance of material. The highest terrace rises upon an average about 250-300 feet above the present river; the surface of the middle terrace is about 100 feet below the surface of the highest, and about the same distance above the level of the lowest terrace. Each of the terraces rests upon solid rock, and it is obvious, therefore, that the several epochs of gravel-accumulation have been separated by epochs of active valley-erosion. In this case the phenomenon of valley-within-valley is clearly the result of climatic changes. The highest terrace indicates the action of flooded rivers escaping from great glaciers. The glaciers then disappeared, or shrank into comparative insignificance, and an epoch of active valley-erosion

succeeded—the rivers cutting their way down for a hundred feet or more into the solid rocks. Next came a return to glacial conditions, and the lowered valley-bottom was again deeply covered with gravels. The glaciers once more retired, and the rivers as before deepened their channels, working down through the gravels, and excavating the underlying solid rocks. Thereafter came a third advance of the glaciers, and a new series of gravels was deposited at a lower level than the preceding accumulation. Lastly, this third glacial epoch passed away, and the rivers again trenched the fluvio-glacial gravels, the upper surface of which is now much above the reach of the greatest floods. It is needless to say, however, that the phenomenon of valley-within-valley is sometimes the result of other than climatic changes. Movements of the Earth's crust have again and again produced similar changes. Sometimes by such movements the valley-gradients have been increased, at other times they have been diminished, and the rate of river-erosion has thus been from time to time modified. Not infrequently, indeed, valley-erosion has been interrupted for longer or shorter periods by the depression of the land under the sea, and renewed upon its re-elevation.

Having discussed the origin of the valleys, Professor Penck goes on to describe the various aspects presented by valleys and the lands they traverse. He then passes in review the several characteristic features of plateaus and plains, and of mountain-regions, such as those of Middle Germany and the loftier heights of the Alps. In each case he points out in detail the relation that obtains between the internal geological structure and the external configuration of the ground, and shows how the ultimate form of the surface, as worked out by denudation, has been determined by the character of the rocks, and the mode in which these are arranged. He then passes on to consider the character and origin of basins or depressions which, save in some desiccated regions, are usually occupied by lakes and inland seas. The author's classification of these basins is partly geographical, partly geological. He describes them under the following heads:—(1.) Basins of dry regions; (2.) Basins of glaciated regions; (3.) Basins occurring in regions of readily soluble rocks; (4.) Basins in alluvial plains; (5.) Basins of volcanic regions; (6.) Basins of mountain regions. The basins of dry regions, such as those occupied by the Dead Sea, the Caspian, Issyk-Kul, the Great Salt Lake, etc., and many dried-up depressions in these and similar more or less desiccated tracts, are doubtless for the most part the result of crustal deformation. Those areas which have formerly been subjected to glaciation are, *par excellence*, the lake-regions of the earth. Many of the larger lakes in those areas are of great extent and depth, such as Ladoga, Onega, Wener, Mälar, etc., in Europe, and Superior, Huron, Michigan, etc., in North America—the bottoms of all the lakes named being under the level of the sea. There can be little doubt that these and similar extensive lakes in the same regions occupy depressions which, however modified they may have been by glacial action, are yet the result of crustal deformation. By far the larger number of the lakes in North America, Northern Europe, Patagonia, and New Zealand, however, are more or less directly due to glacial erosion and accumulation. Their geographical

distribution alone is suggestive of such an origin—for they are restricted to regions in which glacial phenomena are developed. Thus, in Europe, outside of the glaciated tracts, lakes are of exceptional occurrence; and these are confined to districts where soluble rocks abound, to volcanic tracts, and to steppe lands, like those of Hungary. The same holds true for North America. Nearly all the larger and smaller lakes of that vast region lie within the glaciated areas. So also in Patagonia, New Zealand, and Tasmania, lakes and glacial phenomena are closely associated. In each formerly glaciated area we recognise two more or less well-defined regions—a central tract of glacial erosion, and a peripheral tract of glacial accumulation. The latter forms the well-marked *paysage morainique* —characterised by its hummocky surface—and presents a strong contrast to the glacially eroded region which it bounds. Here naked rock comes again and again to the surface—showing the characteristic mammillated configuration known to geologists as *roches moutonnées*. Here also we meet with the eskers and drumlins, and occasional end-moraines, which have already been referred to. In the true *paysage morainique* the lakes, often extremely abundant, are as a rule of relatively small extent and depth. Many occupy hollows which are obviously due to the irregular heaping-up of morainic materials; others appear to have been excavated by "glacier-mills" (*i.e.* by water descending to the bottom of the old ice-sheets), while yet others may have resulted from the subsequent melting of masses of "dead ice," formerly buried under glacial accumulations. In the central region of glacial erosion the lakes frequently lie in true rock-basins; at other times they rest partly upon rock, partly upon glacial deposits, the hollows they occupy presenting now and again the appearance of having been dammed up by morainic accumulations. The rock-basins are not restricted to any particular kind of rock—occurring in granite, gneiss, greywacké, etc., as well as in limestone. Not infrequently rock-basins occur in regions of relatively soft rocks, surrounded by higher ground composed of more resistent materials. In Sweden, for example, certain lakes fill hollows in the Archæan rocks, which there is evidence to show were formerly occupied by Silurian strata. Others, again, are supposed to lie in basins which have been formed by the removal of more or less incoherent weathered rock-stuff. In flat lands which have been traversed by a thick ice-sheet, most of the basins which extend in the direction of glacial movement have been eroded by the ice. They, and the long parallel ice-worn ridges which separate them, recall the appearances presented by the wind-modelled surface of a region of sand-dunes—where long ridges and banks, with intervening hollows, extend in one and the same direction. Here and there, however, where the ice-current has been stemmed by abrupt hills and crags, hollows have been eroded in front of such obstructions, and hence we have a series of lakes occupying "deflection-basins," which extend more or less at right angles to the general direction of glaciation.

The next class of basins described by the author are those which occur in regions where permeable and readily soluble rocks abound. While the basins of desiccated and of formerly glaciated tracts have a wide regional development, those of the class now under review are

naturally restricted to areas where calcareous rocks, gypsum, or rock-salt occur in more or less abundance. A particular account of the various forms assumed by the depressions in such regions is given, and their origin is described; and thereafter the author takes up the subject of "alluvial lakes." A large number of these are more or less temporary. They come into existence when the rivers are in flood, and by-and-by disappear when flood-time is over. Others, again, occupy the deserted loops or bends of rivers, and may have a more or less protracted existence. The basins and lakes of volcanic regions next come in for notice. Many of these occupy old craters; some of the lakes, on the other hand, owe their origin to the damming-up of hollows by lava-streams, while not a few may be due to local depression of the surface, or to unequal deposition of volcanic ejectamenta. The last series of basins considered by Professor Penck are those which occur in mountain-regions. Many of these, generally of limited extent, appear near water-partings. Some of them are due to the unequal heaping-up and distribution of loose materials by the action of the wind, while others occupy slight depressions caused by the removal of rocks in solution. Those which occur in passes are often caused by the accumulation of *débris* derived from the adjacent mountain-slopes. In other cases the dams which retain the water are of morainic origin; while yet other "pass-lakes" lie in rock-basins which have been ground out by ice. On the slopes of the mountains, lakelets formed behind dams of morainic origin are of not infrequent occurrence, but owing to the porous nature of the dams these are generally soon drained away. Again, rock-falls and great landslips have often served as dams, behind which lakes have formed. But the most commonly occurring lakes on mountain-slopes are those which occupy the bottoms of cirques or corries. A corrie is a niche-like recess on the flank of a mountain, usually at a considerable elevation above the bottom of the adjacent valley. Several such corries often occur on the same mountain-slope, rising one above the other. Not infrequently a lake lies in the bottom of a corrie—sometimes occupying a rock-basin, at other times apparently dammed-up by a wall of rock-*débris*. The presence of ice-worn and striated rock-surfaces and moraines shows that the corries are the beds of former small glaciers, which descended no great distance below the *névé* fields of past times. Hence we find that the cirques of any given region occur in determinate zones. Thus in the mountains of Middle Germany cirques are restricted to a zone ranging between 950 and 1050 mètres above the sea. As "secondary" or "summit glaciers" of the kind referred to seldom reach much below the *névé*, the zone of the cirques enables us to determine approximately the former level reached by the *névé* at a certain stage of the glacial period.

It is in the valleys of a mountain region, however, where the largest basins are encountered. These, like all the other basins of such regions, owe their origin partly to causes now in action, and partly to former glacial conditions. In not a few cases lakes have been formed in main valleys by the action of lateral streams carrying down immense quantities of sediment, and so locally raising the bed of the main valleys. Again, a river by raising its own bed sometimes succeeds in damming a lateral

valley. But although lakes of such a kind are well known, yet it is to the action of former glaciation that most of the basins of mountain regions are due. The valleys of all glaciated mountain-tracts have a characteristic physiognomy. They all head in vast valley-cirques; their fall is irregularly step-like; frequently basins extend along the valley-bottom, or, if these be wanting, there is yet evidence of their former existence, unless the whole valley-bottom has been subsequently filled to some depth with later accumulations. The basin highest up such a valley not infrequently occupies the bottom of the cirque-like head; the lowest basin lies near the end of the old glacier—sometimes within the mountains, at other times at their foot, or extending outside of the mountains altogether. The structure of the valley-basins of formerly glaciated mountains shows that some of these are moraine-dammed, while others are excavated in rock. But between these two extreme types occur many which are partly rock-basins and partly dammed-up by morainic *débris* and fluviatile accumulations. In other words, were all the superficial deposits in such mountain-valleys as those of the Alps to be removed, several of the great lakes would be considerably reduced in depth and extent. The level of Lake Constance, for example, might fall about 40 mètres, and the lake would then lose a third of its area. Again, it is supposed that Lake Como is partly dammed-up by the great river accumulations which form the plains of the Po. These are not less than 150 mètres in thickness, and the basin of Lake Como is 400 mètres in depth. Could the old river alluvia be removed, therefore, that lake might be reduced to a depth of 250 mètres, with hardly half of its present area. All the great lakes of the Alps are of recent age—none of them dating beyond Pleistocene times. It is noteworthy, also, that these basins bear no relation to the internal structure of the mountains. They extend across different formations, traversing "saddle-backs" and "synclines" alike; the rock-foldings along the northern borders of the Swiss Alps nowhere influence them: they are younger than the building of the mountains, younger even than the later movements which have affected the low ground at the foot of the Alps. Thus, according to Professor Heim, a depressed anticline, 300 to 400 mètres in height, trends along the foot of the Alps in the region occupied by Lakes Constance and Zurich. This "swelling" affects the older Pleistocene deposits, and is consequently of quite a recent age; and if the basins of these great Alpine lakes had been caused by such deformations, we should have expected to find them lying in the mountain-valleys behind the depressed anticline referred to. But both lakes (Constance and Zurich) extend right across it, the deepest part of the latter being not far from the back of the anticline itself. That the formation of valley-lakes is quite independent of mountain structure is further shown by their geographical distribution. They are present in the Alps, but in the similarly built mountains of the Himalaya they are wanting, while they abound in the highly eroded regions of Northern Europe, where all the elevations are mountains of denudation. Everywhere they are inseparably associated with evidences of glaciation. But, as already remarked, all the lake-basins of a glaciated mountain-tract do not necessarily lie in rock-basins.

Not a few lakes are dammed-up by morainic and other superficial accumulations, or by great rock-falls and landslips. As regards the general distribution of mountain-lakes, one finds that while cirque-lakes and high-lying valley-lakes are met with everywhere in the loftier mountains of the globe, lower-lying valley-lakes, like those of Switzerland and North Italy, are much less widely distributed. They occur only in regions where valley-glaciers have formerly descended to the low grounds. They are wanting in the mountains of the warmer zones, as in the Himalaya, the Andes of Peru, of Ecuador, and Colombia; in temperate regions, as in the Alps of Europe and New Zealand, they are well developed; while in colder zones, as in Scandinavia, they extend far beyond the mountains, and are scattered over the adjacent low-lying tracts.

Having discussed the character and origin of basins, whether occupied by water or not, Professor Penck proceeds to consider the subject of mountains. According to the character of their declivities, mountains may be grouped as follows:—(*a*) Escarpment mountains, built up of strata inclined in some general direction; (*b*) anticlinal mountains, formed of strata dipping in opposite directions from a central axis; (*c*) fault mountains, great blocks bounded by dislocations; (*d*) flexure mountains, built up of highly folded and flexed strata; and (*e*) volcanic mountains. In the formation of mountains endogenous and exogenous agents work together. Movements of the crust and the magma produce the block out of which the agents of erosion subsequently shape the mountain. Further, as we learn from the geological structure of many regions, denudation can in time reduce mountains to a plain. Hence we may infer that all existing mountains are either relatively young formations, or regions of permanent crustal movement. A long and interesting description of the various classes of mountains and their phenomena is followed by an account of the depressed regions of the land. These, for the most part, are low-lying lands; but this is not always the case, for many sunken or depressed areas are met with in elevated regions. Very varied are the surface-features presented by depressed lands. Sometimes they are plains, or they may be hilly and undulating; often they are traversed by a well-marked system of river-valleys, and not infrequently they are basin-shaped. In general, however, they show a flat surface, and this is the rule with those that occur in low-lying districts. The depressions at high elevations, on the other hand, are often intersected by deep valleys. Not infrequently sunken areas are partly or wholly occupied by lakes or inland seas, while now and again they appear as gulfs of the ocean. Several types are recognised, each characterised by a special geological structure. Thus a succession of escarpments dipping, say, in an easterly direction are usually separated the one from the other by long depressions extending north and south. So, again, just as we have high grounds coinciding with broad and flattened swellings of the crust, so we find depressed areas which are obviously geo-synclinal troughs. Once more, some mountains, as we have learned, are bounded by great dislocations. They are mountains because the surrounding tracts have sunk down, and such sunken tracts form another well-marked type of surface depression. Not less well-defined are the flexure depressions which are associated

with flexure mountains. As a rule, these are best developed at the foot of the mountains. Thus we have the depressed region of the Po at the base of the Alps and the Apennines, and the Swiss plain between the Alps and the Jura. Yet another type of depressed land is found lying between volcanic chains, a good example being the lake-dappled region of the highlands of Mexico.

Professor Penck concludes Book II. with an account of caves and the mode of their formation. Book III. he devotes to the consideration of the sea. After some remarks on the general morphology of the oceanic basin, and the contrasts which it presents to the surface-features of the land, the author gives a comprehensive account of modern marine action. The work performed by waves, tides, and ocean currents is discussed in detail, and the formation of river-bars, deltas, coral reefs, and mangrove swamps is described. Movements of the coast-line next come in for treatment. Such changes may be due either to movements of the coast or to actual oscillation of the sea-level, or to both combined. Deformation of the crust is not restricted to the dry land, and the sea-level may be affected either by changes in the capacity of the oceanic basin, or in the volume of water it contains, or by deformation of the surface of the sea itself. Crustal movements may increase or diminish the extent of the oceanic basin, and thus cause the sea-level either to fall or to rise relatively to the land. Again, as the sea is the great receptacle for the waste materials of the land, it is obvious that sedimentation alone must tend to lessen its depth. If, in 12,400 years, the land-surface of the globe were lowered by denudation to the extent of 1 mètre, the sea-level, in consequence of sedimentation, would rise at the rate of 1 mètre in 32,200 years. The volume of water is likewise liable to change. During the glacial period, areas of 20,721,000 square kilomètres in North America, and of 97,138,000 square kilomètres in Europe, were covered with ice. If the mean thickness of the ice were no more than 1 kilomètre, this would imply the removal of at least 25,630,000 cubic kilomètres of water from the sea, and the lowering of the surface by 71 mètres. If the Antarctic regions were contemporaneously glaciated on a similar scale, the sea-level would of course be still further lowered. Nor can we quite ignore the influence which the filling or emptying of inland seas and depressions would have on the general oceanic level. Were all the waters of inland seas and lakes to be restored to the ocean, the sea-level would be raised by 8 mètres. On the other hand, were all the desiccated hollows and depressions of the land-surface to be filled with water, the sea-level would probably sink to a similar extent. The filling of the Aralo-Caspian depression alone would reduce the oceanic level by 4 cm. Now, the glacial period was characterised not only by great ice-sheets and glaciers, but by the presence of numerous lakes and inland seas—many of the broad depressions of the land which are now either partly or wholly dry were then occupied by water, and the removal of this water alone from the sea must have lowered the oceanic level by 8 mètres. Add this to the depression caused by the extensive accumulation upon the land of snow and ice, and we have a lowering of the general oceanic level in glacial times of 79 mètres. But changes in the volume of the

oceanic waters may be caused indirectly by crustal movements. If, for example, a geo-anticlinal were formed across the Strait of Gibraltar so as to convert the Mediterranean into a great lake, the surface of this lake would gradually fall. The lowering of its surface by evaporation to the extent of 500 mètres would raise that of the ocean by about 3·5 mètres. Again, as the surface of the sea is perpendicular to the earth's centre of gravity, it follows that any changes in the distribution of mass within the crust—all crustal and mass movements—must affect the sea-level, and thus bring about changes of the coast-lines. The piling-up of great water-masses in the form of ice upon the land must likewise cause deformation of the sea-level. Thus an ice-sheet tends to produce around it deflection of the plumb-line, and a rising of the sea-level; but any rise of level thus brought about is masked by the relatively greater depression caused by the withdrawal from the sea of the water locked up in the ice-sheet itself. It is conceivable also that changes of sea-level would be induced by changes in the rate of rotation, and in the position of the axis of rotation. Such changes would, of course, affect the lithosphere as well as the ocean; but the latter, owing to its greater mobility, would be more readily influenced.

Although we may look upon the surface of the sea as preserving upon the whole one and the same level, yet, as is well known, this is not quite true. Wind heaps up the water in bays and estuaries, and the surface also rises and falls in obedience to changes in the atmospheric pressure. Again, all sea-water has not the same specific gravity—the less saline areas have a higher level than those which are salter.

While it must be admitted that changes in the position of coast-lines have sometimes resulted from actual changes of the oceanic level, it is no less certain that crustal changes within the land areas likewise produce similar results. Close observation of the Scandinavian coast-lines has shown that a belt of land extending from the Skager Rak to the Gulf of Bothnia is slowly rising in the form of what geologists term a geo-anticlinal. Again, coastal changes now and again result from the gradual consolidation of alluvial and other loose accumulations. Thus, the low-lying lands of Holland, drained by dykes and protected by embankments, have gradually subsided, so that the surface of the land has been reduced below the sea-level. In other low-lying alluvial coast-lands, the gradual consolidation of superficial deposits brought about by underground drainage leads to slipping and subsidence, and permanent changes of the coast-line follow. To the coastal changes caused by movements of the sea-level itself or by movements of the land, we must of course add the modifications induced by the action of the waves and breakers.

Having considered the several causes of coastal changes, Professor Penck next devotes a chapter to the description of sea-coasts. The character of a coast-line necessarily varies according as the land slopes gently or abruptly into the sea. Some coasts show a smooth or even outline, some are broken by numerous indentations, while others are interrupted by great gulfs. Each of these types is separately considered. Smooth coast-lines are sometimes low-lying, sometimes flanked by more or less precipitous cliffs. Indented coast-lines are characteristically

represented by the fiord-coasts of northern regions, and it is to such regions that the famous "Strandlinien" and coast-terraces are restricted. A true fiord is always deeper than the sea immediately beyond its mouth. The north-west coast of Spain is penetrated by deep indentations, such as the Ria de Vigo; and similar narrow gulfs occur in many other regions, as in Cornwall, Brittany, and south-west Ireland. These, however, differ from true fiords in deepening gradually outwards to the external ocean—they contain no basins. In other cases the indentations are of less extent; such are the small semi-circular bays which interrupt the coasts of Malta and the Balearic Islands (*Cala* coasts), and the relatively broad and short indentations which are presented by the coasts of the Red Sea. All these indentations are the result of depression of the land: the fiords and *rias* are submerged valleys, while the "cala"-coasts of Malta, etc., and the "scherm"-coasts of the Red Sea, indicate sunken tracts in regions where the valleys are of little importance. The basins included in true fiords are due partly to glacial erosion and partly to glacial accumulation. The strongly lobate coasts are typically represented in the Greek Archipelago, where deep gulfs penetrate the land, and are separated by bold and lofty peninsulas. Now and again such indentations meet, and form straits. As a general rule, coast-lines of this character are the result of crustal movements. Coral-reef coast-lines are next discussed in considerable detail; and thereafter the author treats of Straits and their origin, and concludes his account of coast-lines by a description of the several kinds of coastal-lakes or lagoons. The work concludes with an interesting description of the sea-bottom, and an excellent account of continental and oceanic islands.

In this rapid outline of Professor Penck's book we have indicated very imperfectly its general scope, but we cannot do justice to the learning which its pages display. It is the most comprehensive treatise on the subject in any language, and will doubtless take rank as a standard work. The style is clear and straightforward, and this makes pleasant reading. We congratulate the author upon the successful completion of his laborious design, and cordially commend his work to the careful attention of all who are interested in geographical and geological studies.

J. Geikie.

THE HIGHEST VILLAGE OF THE CAUCASUS AND THE SHAKH-DAGH.[1]

In the summer of 1892 M. Pastukhoff made a journey in Daghestan to execute topographical surveys. On the 28th August, with six troopers, he left his camp, situated on the flank of the Loss range at a height of 7742 feet, 3½ miles to the north-west of the village of Diibuk, his chief object being to visit two of the highest villages of the Caucasus, Chirakh and Kurush, and to ascend the summit of the Shakh-dagh

[1] From an article by M. Pastukhoff in the *Zapiski* of the Caucasian Branch of the Imperial Russian Geographical Society, Book xvi.

(Mount Shah). Passing through the village of Ghint, he ascended the western extremity of the Loss range, where he met flocks of sheep returning from the upland pastures, and halted on the banks of a stream descending from the Shunu-dagh, at an elevation of 7350 feet. A violent storm, with rain and hail, prevented his pitching his camp. After two hours the sky cleared and the thermometer fell to 39° F. In the morning the whole country for a mile above his camp was covered with hoar frost. It lay especially thick on the summit of the Shunu-dagh. This mountain bears a strong resemblance to the Gunip; it is begirt on all sides with bare cliffs, which on the northern side form three rows with large terraces between them. The surface within the rocks has an area of about 4½ square miles, and forms a hollow intersected by deep ravines, at the bottom of which abundant streams flow towards the north-west. The whole hollow is clothed with luxuriant grass, and constitutes one of the best upland pastures, where, from the beginning or middle of May to the end of August, animals of various kinds, chiefly sheep, are fed. The highest point of the mountain is 9733 feet above sea-level, and from this elevation the whole of Daghestan can be seen. The view of the snowy ridge of the main chain of the Caucasus and its nearest spurs is charming.

Khosrek was next visited, a village of 1600 inhabitants lying at an elevation of 7032 feet. To the east of it stretches a larger valley covered with a continuous succession of arable fields. A good carriage-road passes through Khosrek, running from Kasum-kent to Gunip, and there is considerable traffic on it as long as it is free from snow; but between Khosrek and Chirakh, a distance of 15 miles, communication is stopped in winter. On this section, at the Kokma pass, lies the highest point of the route, 8470 feet above sea-level. The neighbourhood of Khosrek is entirely bare of trees; and only at a distance of 2½ miles from the village are birches found in small thickets. After crossing the pass already mentioned, M. Pastukhoff halted for the night on one of the little meadows bordering the Chirakh-chai. Rain commencing at two o'clock, continued with short intervals all through the night, and the thermometer sank to 33° F. In the morning the surrounding mountains were covered with a fresh layer of snow.

On that morning, August 30th, the village of Chirakh was reached. It is the third highest on the Caucasus, standing 7430 feet above sea-level. Situated on a steep slope facing south, it is composed of irregular rows of houses, so built that the roofs of one row are on a level with the foundations of the one above. The inhabitants number 194, and dwell in 169 houses. Trees are not to be seen in the neighbourhood, but grass grows vigorously on the rich black soil, and the corn crop is excellent, owing, perhaps, to favourable meteorological conditions.

Above and below Chirakh the channel of the Chirakh-chai expands considerably, forming a broad valley and permitting the villagers to lay out large arable fields; and it is doubtful whether there is another village in the Caucasus where the proportion of cultivated fields to the number of the inhabitants is as large as at Chirakh. The people belong to the Dargin tribe and speak the Vurkun dialect.

Having passed through the villages of Richa and Balek, M. Pastukhoff left the carriage-road at Ghelkhan, and ascended in a south-western direction by a very fair footpath to the Sarfup-iall range, passing the lake Chilit. It lies in a basin at a height of 8295 feet. Lakes are rare at such an elevation, and are scarcely ever found at all in the mountains of Daghestan. The lake is 490 feet long; its depth was not sounded, but it must be insignificant, for weeds cover the whole surface except at the south-western corner, where, probably, the maximum depth is to be found. Diminutive frogs inhabit the lake in great numbers, but large ones are scarce. Insects of several kinds swarm about it. On the south-eastern side are two springs, and at the north-north-east a nameless stream issues, and flows down to the right bank of the Chirakh-chai. As the water drained from the lake has twice the volume of that supplied by the springs, there must exist a source beneath the surface of the lake. At the time of M. Pastukhoff's visit the temperature of the air was 48° F., and that of the lake at its outlet 51°, while at the opposite southern bank it was 50°, and in the springs 37·6°. Four islets, or rather hillocks, are situated off the northern bank, where small birds are continually chasing insects. In some parts the weeds are so dense that the birds can sit upon them. The water of the lake is agreeable to the taste, and has no smell. Judging from the bed of the issuing stream, and from the banks, the traveller concluded that the water of the lake had never been higher than at the time of his visit.

The path ascends by zigzags from the lake to a spur of the Sarfup-iall, and then divides into two branches, of which one turns south-westwards to the village of Khanugk, while the other runs due south to the village of Kicha. By the latter the expedition reached the Grysall Pass, 9065 feet high. Here was erected a cairn in which were thrust sticks decorated with coloured rags—a monument to the memory of some man of great piety. Such monuments are often seen in this country, and always by the roadside, though the bodies of the deceased lie in the public graveyards. From the pass the path descends to the Irakh over a very steep declivity, winding along with innumerable curves like a crawling snake. At the headwaters of the Irakh, and beside its tributaries, are traces of old glaciers which must have been of large proportions. Kicha, Irakh, and Lakun were the villages next passed through, and the river Samur was reached a little above the village of Kiuliutl (894 inhabitants). Here the scenery changed its character. Instead of sharp crests, narrow deep ravines, sometimes nothing more than fissures, a complete absence of trees, and an oppressive monotony of landscape, a broad and highly picturesque valley lay before the travellers. Fruitful gardens, vineyards, meadows, and broad fields stretched in endless succession. The corn was already harvested, and the fields ploughed for the next sowing, some of the millet only being still on the ground.

Akhty is the residence of the Governor of the Samur district, and the largest town in the district, containing 5935 inhabitants, most of them Kiurins, though there are also a few Persian and Jewish families engaged in trade. Though September had begun, the thermometer stood at 79° F. in the shade. Akhty has large orchards, vineyards, tobacco plantations,

and even kitchen-gardens, which, in the Daghestan highlands, only exist, as a rule, at the headquarters of a military detachment. A journey of 3½ hours brought the traveller to Miskinja, a village of 2833 inhabitants, and the only one in all Daghestan that is peopled by Persian Shiites. Their forefathers sought refuge there in the times of Nadir Shah, and though a century and a half has since passed away, these villagers retain their racial type, costume, and tongue. Megerak was reached the same evening by a path across a northern spur of the Shalbuss-dagh.

On the next day M. Pastukhoff came first to the small village of Pir-kent, where a wedding was being celebrated. Opposite one of the huts, decorated with improvised flags, stood pots for cooking food, and around them the elder women were bustling about; the balcony of the house was full of girls and young women. In the street, a large crowd formed a circle, within which dancing was going on. The dance was supposed to be the Lesghian; but some men who danced near the party, with their grimaces and heavy jumps, recalled the awkward antics of badly-trained bears, much to the amusement of the Avars among the escort—for the Avars are excellent performers of this graceful dance. This was the first entertainment after an epidemic of cholera, during which all friendly intercourse was suppressed.

Between Megerak and Pir-kent there is a carriage-road, but carts are not driven farther on the way to Kurush, though the road is broad enough and there are no steep ascents. A fine grove of aspens grows on an old cemetery on the south side of Pir-kent, and these are the last trees on the way to Kurush. Along this track, eight miles in length, seven dry ravines and nine streams, descending from the flanks of Shalbuss-dagh, were crossed. Along the banks of these streams large heaps of mud and stones bore witness to the degrading power of the rains, and large boulders lay in their beds. Indeed, the whole country between the villages, the river Kurush-vats, and the Shalbuss-dagh is bestrewn with stones of various sizes which have fallen from the summits of the mountain.

Kurush is the highest inhabited place in the whole of the Caucasus. It stands at an elevation of 8175 feet above sea-level, and 6849 feet above Tiflis, on the southern spur of the Shalbuss-dagh, in lat. 41° 61′ 56″ N., and long. 47° 22′ 55″ E. Its distance from the Caspian Sea is 54 miles, from Kuba 37 miles, and from Derbent 76. The name Kurush is said to be derived from that of the Arabian tribe, the Koreish, to which Mohammed belonged, and from which the inhabitants trace their descent. According to them, one of the Koreish tribe brought his family and settled down here at a very remote period. Where he came from, and exactly when, the Kurushites cannot tell. Though of a mythical character, this tradition has, however, some foundation in historical facts. An Arab colony existed in Daghestan as long ago as 763 A.D., and in that year was reinforced by the immigration of 17,000 families from the inner provinces of the Khalifate, among whom very probably may have been some of pure Arab blood, and by these Kurush may have been founded. But only a part of the villagers accept this version, while others affirm that their forefathers were Turks, who at some unknown

date entered Transcaucasia and founded the village of Nadar, in the district of Nukha, and that some of them, crossing the main chain of the Caucasus, found rich unappropriated pastures in the neighbourhood of Shakh-dagh, which they visited every summer with their herds. After a time they planted corn, and, finding that it thrived, ultimately established themselves permanently at the present village, formerly called Nadar-Kurush. In course of time new settlers arrived, and at the present day the population numbers 4664, of whom 2527 are men and 2137 women. The Kurushites also say that their forefathers were at one time Christians, but embraced Islamism in the seventeenth century. They are now of the Sunnite sect and are very religious, many of them being Hajjis. The village has five mosques and three *mollas*. There is no school, but each *molla* teaches boys in his own house; and about half the men can read the Koran, while a few have reached a somewhat higher standard of education. Grazing is the principal occupation, and has made the Kurushites so prosperous that the village is one of the richest in the Samur district. The rich men, of whom, indeed, there are few, own as many as 100 horses and 2000 sheep each, besides cattle and asses.

The pasturage belonging to the village is of large area, but does not suffice for all the cattle and sheep during the four summer months, and therefore the villagers lease from the Crown almost the whole of the valley of the Shakh-nabat with its excellent Alpine pastures. In winter, too, nearly all the cattle are driven into Transcaucasia, where many of the owners possess lands in the Nukha district, while others lease them from the Crown or the local authorities. A large part of the inhabitants of Kurush migrate in winter with their cattle. The snow then falls in such quantities as to fill the streets up to a level with the roofs. The inmates pass over the house-tops to visit one another, or to fetch water from the springs, while communication with neighbouring villages is entirely suspended.

Agriculture, owing to the scarcity of arable land and of manure for it, is of minor importance. The abundant moisture of the air renders artificial irrigation unnecessary. Barley, rye, oats, and lentils are grown, supplying the Kurushites with about half the quantity they consume; the other half being bought in the Kuba district. The tilled fields lie at altitudes varying from 6440 to 8500 feet. It not infrequently happens that the corn does not ripen, and has to be cut down as fodder for cattle. Other industries, besides grazing and tillage, are carried on in Kurush—weaving, felt-making, the manufacture of butter and cheese, etc.; and the village boasts of thirty-one artisans.

The streets are narrow, winding, and, as in all Caucasian villages, dirty. The houses have two stories, the lower being constructed of hewn stone, while the upper, notwithstanding the abundance of suitable stone, is built of bricks composed of clay and stubble. This structure easily gives way to the force of the rain and snow, and the use of these bricks seems unreasonable when such excellent building material is at hand, and is only to be explained by the theory that the Kurushites introduced the practice from the plains, where there was no other material. The lower story is occupied by the cattle, and the upper by

the members of the family. The roofs, formed of the same mixture of clay and stubble, are flat. The interior of the upper flat, usually consisting of a single room, is on an average 21 feet long, 12 broad, and 8 high, and is thoroughly ventilated through the unglazed window and the hole in the roof where the smoke escapes. Furniture there is none, except some three-cornered stools. The dress of the men does not differ from that of the Transcaucasian Tartars, but the women's is very original, and more like a man's than a woman's costume. The most striking peculiarity is a pair of exceedingly wide pantaloons, ending below in short tight worsted socks wound round with a narrow ribbon, which make their wearers look somewhat like French Zouaves. On the whole the clothing of both sexes is sufficient, and keeps out the cold and damp, except the shoes, which are not watertight. The food of the Kurushites is not of great variety, but is always fresh, and, consisting principally of meat and milk products, may be considered nourishing. Both the men and the women are industrious; and in this the former differ from their fellow-countrymen of Central Daghestan, who leave almost all the work to the women.

Plurality of wives is extremely rare in the highlands of Daghestan, and only very rich men possess two or three. But in Kurush polygamy is not so rare, nor is it a criterion of material prosperity. Twenty-eight men have more than one wife, and of these, only two are men of large property. Divorce is common, and, as it is easily accomplished, some men have changed their wives several times in the course of their lives. Nor is it a rare occurrence for a divorced couple to marry again; one man married the same wife five times, the motive force in this case being a sum of 200 rubles (about £20) which the woman always promised, when they were separated, to give the man on their marriage, and as regularly refused to hand over when they were married; at length her death by cholera left him in possession of the long-coveted money, and with this attraction, though ninety years of age, he procured another wife. As, according to Mohammedan law, a divorced wife cannot marry the same man again until she has been the wife of another for at least three months, the woman must have had four other husbands.

The most prevalent and deadly disease in Kurush is rheumatism; diphtheria and scarlet fever, though not often fatal, are always present. In 1892 the cholera visited Kurush for the first time in its existence, but owing to the great altitude of the village, it did not assume an acute form. While here only 81 persons were attacked by the disease, of whom 36 died, at Megerak, 3600 feet lower, 500 out of a smaller population were attacked, and 200 died. The longevity of the villagers is remarkable, if the information given to M. Pastukhoff may be relied on. There are three persons of more than one hundred years of age still living; while, the year before M. Pastukhoff visited the place, a man died at the advanced age of one hundred and twenty. Theft is said to be very uncommon among the Kurushites; murder is expiated by the payment of a sum of money to the relations of the murdered man. In superstition and prejudices the Kurushites contrast favourably with the other inhabitants of Daghestan.

To the north-north-west of the village stands the Shalbuss-dagh, rising to a height of 13,679 feet; on its summit is a holy place to which every year a number of pilgrims, especially women, resort. They often come from far distant places, and are to be seen on their way any day, from spring till late in the autumn, particularly on Fridays. There is some kind of erection on the summit said to have been constructed by a hermit who lived, prayed, and died in it. Four and a half miles to the south of Kurush, on the other side of the river Kurush-vats, rises the Nesen-dagh, or Midday Mountain, by which the Kurushites ascertain the hour of noon; its absolute height is 13,020 feet. A little to the east lies a summit which bears the strange name of Vakhchak-dagh; the word *vakhchak* denotes the women's pantaloons already mentioned, and is applied to the mountain because of its supposed resemblance in form to that garment. The mountain has two peaks of nearly equal height, one of them rising to 12,250 feet. On the northern flank the stream Vakh-chak-vats, a tributary of the Kurush-vats, takes its rise in a small snow-field. To the east of the mountain is a pass much frequented by the sportsmen of the neighbourhood, who pass over it from one side of the main range of the Caucasus to the other. Still farther east, in lat. 41° 13′ 19·7″ N., and long. 47° 24′ 37″ E., stands the Kichen-dagh, the culminating point of this part of the range. Its absolute height is 14,722 feet, or 760 feet more than that of Shakh-dagh. Its summit is a small plain sloping slightly to the east. There are considerable fields of perpetual snow on this mountain, and eight glaciers of large extent for this country; the largest, named Tikhitsar (meaning "extreme cold"), with its snowfields covers about 420 acres. Its lower part is encumbered with stones and rubbish, and moraines stretch along its sides, and traces of them can also be observed in the valley below, indicating the former extent of the glacier. From under this glacier flows the Seldis-vats, which is sometimes loaded with rubbish that falls from the ice. Of the other glaciers, two are situated on the southern slope, and two others occupy the upper parts of the ravine whence flows the river Shakh-nabat, of which one is partly fed by the snows on a northern spur of the main range of the Caucasus. Across it runs a bridle-path into Transcaucasia. Three-quarters of a mile beyond the glacier it divides into two,—one branch passing round the eastern slope of the Bazar-iurt (12,005 feet), and crossing the main range at a height of 11,340 feet, while the other skirts the same mountain on its western side, ascends to the crest of the range at a height of 10,914 feet, and follows it westward for a short distance before turning southwards along one of the spurs. To the east of the Bazar-iurt lie some unnamed peaks, and then comes the Trfan (meaning "flood"), the last snow-covered summit of the Caucasus in this direction. Its latitude is 41° 9′ 50·9″ N., and longitude 47° 32′ 37·3″ E., and it rises to a height of 13,764 feet. On its flanks are two lakes, formed, according to the Kurushites, at the time of the Deluge; bones of the mouflon and of various birds are, it is said, found on their banks. The Kurushites attribute to the waters of these lakes a miraculous power of putting an end to drought and allaying storms; and, accordingly, when rain is wanted, some of the elders go with the *molla* to fetch

water from one of the lakes, which, in the presence of the whole population of the village, is poured with many prayers and ceremonies into the river, and abundant rain soon follows—so say the Kurushites. Water from the other lake is similarly used in continued stormy weather.

The Shakh-dagh, like the majority of the loftier mountains of the Caucasus, stands on the northern side of the main range, with which it is connected by a ridge starting from the Kichen-dagh. The Shak-dagh has the form of a ridge running from west to east for a distance of 8 miles. The highest point, 13,962 feet, is at the eastern end, in latitude 41° 16′ 14·6″ N., and long. 47° 33′ 10·6″ E. In answer to M. Pastukhoff's inquiries the Kurushites could only tell him that a petrified flock of sheep was to be seen on the mountain, with a petrified shepherd thus punished for deadly sin. Nevertheless, one of them offered his services as a guide, which M. Pastukhoff, with a view to save time, as he thought, accepted, and bitterly repented of the bargain.

The party left Kurush on September 4th, a calm and clear day. On reaching the Kryva pass, where a fine view of the southern flank of Shakh-dagh was obtained, M. Pastukhoff remarked that the summit might be most easily reached by following the course of the Ghiavdan-vats, but the guide assured him that the mountain was inaccessible from that side, and led the way to the eastern extremity of the ridge. The horses were left at an altitude of 9870 feet, and the night was passed on a bare rock. In the morning, after wandering about the rocks for some hours, the party had to return to the river Ghiavdan-vats, the guide acknowledging that he was quite ignorant of the route. Following the stream, they arrived at 4 P.M. at a place where, flowing between two cliffs, the river formed a large and beautiful cascade. Dismounting here, M. Pastukhoff and his men continued the ascent, and a few steps farther saw, on the other side of the stream, three mouflons calmly observing them. Marching up a steep slope covered with fine detritus, M. Pastukhoff soon discerned faint traces of a track, which became plainer and plainer as he ascended, and gradually expanded to a path eighteen inches wide leading up the gully that descends from the west of the summit of Shakh-dagh. Many other tracks were noticed, all of them made, no doubt, by the mouflons. The bottom of the ravine, from the summit to the waterfall, was evidently at one time filled by a glacier ; but now even such traces of its former existence as moraines and polished rocks have disappeared under a mass of stones of all sizes that have fallen from both sides of the ravine. This accumulation shows that a long time has elapsed since the glacier existed, and that the rocks have been subjected to powerful disintegrating forces. Now only a small glacier occupies the upper extremity of the ravine, its ice being formed in a snowfield (*Firn*) descending from the northern slope of the summit. Up this slope the party ascended with some difficulty and danger, and, on coming to a ridge covered with six or seven inches of new-fallen snow, turned towards the south-east and hurried on, helped by a strong wind that buffeted them sharply on the back, with the hope of reaching the summit before dark. Soon, to their great astonishment, they perceived a small but very beautiful lake in a deep and longish hollow on the right, and at its south-eastern

corner a glacier, which broke off abruptly, forming a wall of ice nearly 30 feet high. The lakelet was about 350 feet long, with a maximum breadth of 70 feet. It was not marked on the maps M. Pastukhoff carried with him, and the Kurushites had denied the existence of any pools on the mountain. Evidently, then, he was the first to admire this sheet of water, perhaps the highest lake in the Caucasus, lying at an elevation of 12,320 feet. A few yards farther another pool, only 70 feet long by 40 broad, was seen on the left. Lying at such a height they could only be discovered by mere chance, and therefore might easily escape the notice of the most conscientious surveyor.

The farther the party advanced, the more M. Pastukhoff became convinced that the summit could not be reached before dark; and, as the wind had freshened, he began to look out for a suitable spot to camp in. But all around was nothing but great drifts of snow, and no protection against the wind, which now howled and whistled and raised clouds of snow-dust. At last, at a height of 12,852 feet, a refuge was found beneath two immense blocks of stone, which sloped together, forming a large penthouse turned away from the direction of the wind. There he left three wearied men and the guide, while with another he continued the ascent. After climbing a short distance eastward, he came to the saddle which constitutes the summit of Shakh-dagh, and turned along it to the north. The wind by this time had become so violent that he was obliged to keep a little below the top of the ridge lest he should be hurled down the slope. A black cloud lay on the western horizon, and the lightning flashed out every minute, while round the mountain spread a thick white mist, which rolled up the ravines and threatened to envelope the summit. Therefore M. Pastukhoff and his companion, collecting all their strength, hastened on with all possible speed, hoping to reach the top before the mist. They were tormented with terrible thirst, which they could only allay with snow and ice, and their path was obstructed by huge drifts of snow, which they were obliged to go round as they were too soft to bear their weight. Sometimes they came to a stretch of more compact snow down which they could slide. All difficulties, however, were finally overcome, and at dusk they reached the western extremity of the summit, and, turning eastward, were helped by the wind up to the highest point. Through a thick cloud of snow-dust, blown about by fierce gusts of wind, they saw the wavering semblance of a human figure, which somewhat puzzled them, but going on quickly, they soon came to a high stone cairn, erected probably by the surveyors when laying out the network of the Transcaucasian triangulation. At a few steps from the cairn, M. Pastukhoff halted to impress on his memory all the details of the surrounding scene that could be discerned in the fading light, as the unfavourable weather held out no promise of another opportunity.

The summit is elongated and flat, and runs from east to west; along its whole extent, which is considerable, it is only 14 feet broad. A wall of bare rock, three feet high, skirts its northern side, which is occupied by a snowfield (*Firn*), $1\frac{1}{2}$ square miles in area, sloping gently to the north, and terminating in huge bare cliffs. On the southern declivitous side, covered with rubbish and small stones, there is no perpetual snow.

Having spent about an hour on the summit, and suspended a minimum thermometer on the cairn, M. Pastukhoff started on his way back to the place where his men were encamped, the last gleam of light having vanished, and the whole scene being plunged in black darkness, the stars only faintly lighting up the adjacent summit, which rose a black mass amidst a white sea of cloud.

The minimum thermometer was carefully carried down to the shelter under the large blocks of stone, and, on being read by the light of a match, was seen to stand at 25° F. Snow fell heavily during the night, and the shelter was filled with mist, but the party were warm and comfortable. The thermometer sank to 24·2° F. At seven o'clock in the morning the party left the camping-place, and the snowstorm having somewhat abated, M. Pastukhoff was able to make a rough sketch of the topography of the summit. At two o'clock he reached Kurush, where he stayed two days, and on September 9th started for Derbent, arriving on the following day.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings in January.

On January 24th Sir W. Renny Watson lectured before the Society in Edinburgh on "The Hawaiian or Sandwich Islands." Sir Thomas Clark, Bart., presided, and a vote of thanks was awarded to the lecturer on the motion of Lord Dalrymple.

On the same evening Mr. John Smith, of Glasgow, delivered a lecture to the Dundee Branch on "Andorra: the Republic of the Pyrenees." Mr. John Robertson, of Elmslea, took the Chair, and proposed a vote of thanks to the lecturer.

Mr. J. Smith repeated his lecture in Aberdeen on the following evening, January 25th, when Professor Pirie presided, and a vote of thanks was awarded the lecturer on the motion of Mr. Ferguson of Kinmundy, seconded by Mr. Diack.

A meeting was held in Glasgow on January 29th to hear Mr. Smith's lecture, Sir W. Renny Watson presiding.

On January 31st Mr. Smith lectured in the Society's Hall, Edinburgh; Dr. J. J. Rogerson took the Chair.

An interesting and instructive set of educational lectures on "Mountains and Mountain Ranges" has been delivered in the Society's Hall, Edinburgh, by Mr. H. M. Cadell.

Meetings in February.

On February 7th, at 4.30 P.M., Vice-Admiral P. Colomb will narrate some reminiscences of life and adventure on board a man-of-war in years gone by. Captain Hamilton Dunlop, R.N., will preside.

It has also been arranged that Admiral Colomb shall address the Glasgow Branch on February 11th, in the Hall of the Philosophical Society; on February 13th he is to narrate his experiences before the Dundee Branch in University College; and on February 15th he will lecture to the Aberdeen Branch. All the above meetings will be held at 8 P.M.

Commander Keane, of H.M.S. *Edinburgh*, will lecture in Edinburgh on February 21st.

Sir William MacGregor has promised to address the Society in March. Prince Galitzin will read a paper some time in that month, and Captain Younghusband will lecture early in April.

GEOGRAPHICAL NOTES.

By The Acting Editor.

ASIA.

The Pamir.—According to the latest agreement between Great Britain and Russia, Afghanistan is to retain possession of the country along the Panj river, and its side valleys up to Yashil-kul and Sor-kul; and the watershed between the Aksu and the tributaries of the Yarkand-Daria is to form the boundary towards Chinese Turkestan. Russia's share embraces in the north all the highlands between the Alai valley and the Murghab, and stretches up to the sources of the Aksu. Thus the Russian territory forms a wedge between the territories of Afghanistan and China, its southern extremity extending to the vicinity of Boz-i-Gumbaz.

Temperature of Verkhoiansk.—In vol. iv. p. 660, this town was mentioned as the coldest place in the inhabited world. It lies in east Siberia, in lat. 67° 34′ N. and long. 133° 51′ W., at an elevation of 350 feet above sea-level. The lowest observed temperature was – 90° F. Professor Wild, who has spent a whole year in Verkhoiansk to observe the temperature, has recorded the following monthly means: January, – 63·6°; February, – 51·3°; March, – 53·9°; April, 3·6°; May, 31·8°; June, 49·3°; July, 56·8°; August, 43·5°; September, 3·2°; October, – 4·4°; November, – 40·2; December, – 57·8°. The mean for the year is 2·7°.—*Deutsche Rundschau*, Jahrg. xvii., Heft 4.

Central Asia.—The reports of the engineer, V. A. Obrucheff, geologist of the Potanin expedition, in the *Izvestiya*, are summarised in *Petermanns Mitt.*, Bd. 40, No. 12. M. Obrucheff travelled from Kiakhta to Kalgan in two months. From Urga to Kalgan and from Kalgan to Pekin he followed for the most part routes previously traversed by Przhevalski, Pevtsof, A. Bunge, Richthofen, and other travellers; but he made some excursions into the country neighbouring on his route, and has collected some notes on the country between Tsi-min-chau and Tsui ün-huan, which was not visited by Richthofen.

The region between Kiakhta and Urga is reckoned by Richthofen to belong to the Central Asian transitional zone, and to this M. Obrucheff would add the country to the north of Urga up to the southern slopes of the Saian mountains, thus including the basin of the Selenga and its tributaries, the Jida and Temnik. The country between Kiakhta and Urga is an upland steppe, for the greater part has no forest, except in some of the river valleys and on the northern slopes of the mountains, where grow birches, firs, and pines. The mountain chains rise 1000 to 1500 feet above the valley bottoms, and to an absolute height (near Urga) of 2600 to 3200 feet. Tall grass clothes the slopes and also the valleys, except where groups of poplars and willows are found.

In the river-banks layers of loess, six to ten feet thick, appear under sand, loam and clay, deposited by water.

As regards the rocks of the region between Kiakhta and Urga, two zones must be distinguished. The northern, extending to the vicinity of the sources of the Boro, a southern tributary of the Khara-gol, consists principally of volcanic rocks of old and more recent origin, while in the southern zone metamorphic sedimentary rocks, probably of very great age, predominate. In the northern are found violet-grey lavas and amygdaloidal rocks, light and dark-grey sandstones and argillaceous schists, fine-grained granite and granitic porphyry, dark porphyrite and fine-grained syenite, coarse granite, and finally syenite with dykes of diorite. On the bank of

the river Khara-gol, near the station Urmukht, greyish-green argillaceous schists form great cliffs. In this rock have been found impressions of two kinds of *Fenestella* and of a coral. The principal rocks of the southern zone often change their strike, so that here two systems evidently cross one another, one running from north-west to south-east and the other from south-west to north-east. The mountains are of the form so common in Transbaikal—masses carved out by circumdenudation.

According to Obrucheff, Eastern Mongolia merits only the name of steppe, for it assumes a desert type only in a few spots here and there, and cannot compare in sterility and drought with the genuine deserts of Africa, Arabia, the Tarim basin, and Ala-shan. M. Obrucheff did not meet with the immense development of loess which Richthofen considered to be characteristic of Eastern Mongolia. Sub-aërial forces were not, he says, the principal agents in the moulding of the surface, but the sea, with its deposits and the levelling action of its waves, contributed most to the building-up of its physical features, and, after the sea disappeared, the sub-aërial agents were unable to essentially alter the character of the country. Eastern Mongolia is an immense plateau abraded by the sea, and still covered in many places by marine deposits ; these massive strata have been separated by subsequent erosion into isolated buttes and mesas, between which the earlier sea-bottom of much older rocks crops out. These strata once composed the whole of the mountainous region, but now form only the crests and groups of flat, low hills.

The strike of the mountains from west to east, formerly delineated on maps, does not appear to exist. For the most part the most important elevations of Eastern Mongolia are not ranged in regular chains, but take the form of flat hills, between which continuous ridges occasionally appear. Nor does the geological formation indicate such a strike. The oldest rocks—as, for instance, the gneiss, containing biotite and hornblende, of the hills of Tsara—run from north-east 35-50 to the south-east. The crystalline limestones, alternating with micaceous quartz, run sometimes to the north-east ; and the various metamorphic rocks, as quartzite, lydite, schists, conglomerates, etc., have all strikes running between north-east to south-west and east-north-east to west-south-west, or at right angles to these directions. Of the eruptive rocks, which attain a great development, the greater part are younger than these old sedimentary deposits ; granite, granitic porphyry, felsite, diorite, and trachyte exist in great masses, especially near Kalgan. All these rocks are probably older than the marine sediments.

In the Gobi system Obrucheff recognises two distinct horizons—the conglomerates of Kalgan and the sandstones of Baga-ude, which probably belong to the Cretaceous or Lower Tertiary series, as they are overlaid with basalt ; and a later horizon of marl, conglomerate, and sandstones, formed after the ejection of the basalt. Only one fossil was found, the lower jaw of a fish, eight or ten inches long by about three inches broad, buried in a light green marl.

As the result of his investigations on the march from Fönn-chau-fu to Lan-chau, M. Obrucheff states that the highlands and plateau of North China and Alashan are composed of a continuous system, beginning with Carboniferous limestone and ending with red sandstone, probably of Tertiary age. The dislocations probably date from the end of the Mesozoic or the beginning of the Kainozoic age. In the east they are associated with clefts and flexures, running north and south, while in the west folding is the characteristic form, two systems being noticeable in directions north-west to south-east and north-east to south-west respectively. The former is the newer system and more strongly marked. At the end of the period of faults the sea (probably a southern arm of the Han-hai) advanced to Lan-chau, abraded the mountains, and caused the depo-

sition of red clay, yellow and red sandstone, red and grey conglomerate, very similar to the marine formations of Eastern Mongolia. The enormous masses of typical unstratified loess are found in China, not in this region. The loess gradually disappears towards the insulated orographical basin of Central Asia, and is replaced by sand and lacustrine deposits, which cover the latest deposits of the Han-hai. Central Asia produces the loess, but it is deposited only along its periphery.

Annam.—In March 1893, M. Bonin, Chancellor of the Residency of Than-Hoa, was sent by the Government to search for a route between Tourane, the principal port of Annam, and the Mekong. Leaving Tourane on March 6th, M. Bonin ascended the river Song-caï as far as Ben-Hiep or Cho-Tau, a desert tract where the Annamites barter with the barbarous tribes of the interior. Hence, keeping a straight course to the west, through virgin forest and pathless mountains, he reached the crest of the watershed on March 21, and the same evening entered Attopeu. The river of Attopeu, the Se-kong or Nam-kong of the Laotians, the principal tributary of the Mekong, drains the eastern part of Laos. M. Bonin followed it from its source to its mouth in the Mekong, below Stung-treng. Two territories were crossed—the Moï country, extending inland to Arun, and the Laos country, reaching from Ban-kha, above Kumg-khang, to the Mekong. Between Arun and Ban-kha the surface is clothed with an uninhabited forest, where M. Bonin travelled for four days without encountering a human being or seeing a single dwelling. M. Bonin succeeded in navigating the Attopeu in canoes from Adrac, above Arun, to the Mekong.

The villages of the Moïs are composed of large houses, occupied by several families. Each hamlet has also a meeting-house and a number of small huts, used as granaries. The adult population may be estimated at from 8000 to 10,000. The villages on the Laos side are more numerous, more populous and prosperous, than those on the Annamite slope. The chief crops are mountain rice, sweet potatoes (which are the principal article of food), pineapples, tea (growing wild), and tobacco. Cinnamon M. Bonin saw only once, at Aoh. The richer tribes own some buffaloes, reserved for sacrificial feasts. The other domestic animals are the pig, the goat, the dog, and the fowl; there are no horses or tame elephants. The Moïs manufacture iron weapons from ore found in the mountains, of which M. Bonin obtained specimens. The people of Tarwi manufacture bags from pineapple fibres, which are much in request among the Moïs. The banks of the river are rich in bamboo, and fine forests of pine cover the summits looking towards the plateau of the Bolovens.

At the boundary of Laos the river changes its character. To scarped mountains, the *débris* of which forms rapids in the river, succeed hills becoming lower and lower towards Attopeu, where a plain commences which extends to the Mekong. The banks are still wooded, but villages frequently appear among the trees. Rapids are still numerous, but do not present impassable obstacles to navigation. The name Attopeu denotes a conglomeration of villages situated at the confluence of the Se-kong and Se-kenan; it takes two days to pass through them in a canoe. Siamese authorities were then in power, and tried unsuccessfully to intercept M. Bonin.—*Comptes Rendus* of the Paris Geographical Society, No. 17, 1894.

The Volcano Awu in Great Sangir.—The Dutch Controleur, L. Holke, ascended in March 1893 to the summit of this mountain, which caused such great devastation by the eruption in 1892 (see vol. viii. p. 492). From Tarima, Heer Holke went by boat to Anggis, a village from which the crater could be reached in four or five

hours. The route led for the first hour and a half through gardens and plantations where no trace of the eruption was visible ; then open grass land was entered where patches of brownish-grey ashes were seen. Soon after, the path which formerly led to the crater came to an end, the remainder being buried under a thick layer of volcanic ash. Two hours later, the last living vegetation was passed, and only bare ridges were visible, and three broad, deep ravines showed the course by which the lava and boiling mud had found its way to the sea. After six hours' march the crater edge was reached, which is separated by a belt of sand 50 yards broad from the crater proper. The latter is about 160 feet deep, with precipitous sides, its bottom forming an oval plain, at the edge of which lies a small, longish lakelet of sky-blue water. Around smoke, hiss and splutter a number of solfataras and mud cones, which occasionally shoot up a little boiling mud and yellowish water into the air. Seven such cones were counted on the bottom of the crater, which is about 240 square yards in area. The pool has an area of about 12 square yards, and its surface is never ruffled ; the natives say that it was in existence before the eruption. —*Globus*, Bd. lxvi., No. 13.

The Macclesfield Bank.—In the centre of the Chinese Sea, about midway between Annam and Luzon, is a great bank about eighty miles long and thirty broad, known as the Macclesfield Bank. It rises rapidly out of the deep water to an average depth of 40 fathoms from the surface. As it is in the route of vessels, the Admiralty undertook a detailed survey of the bank, a work which was performed by the *Rambler*, *Penguin*, and *Egeria* in the springs of 1888, 1892, and 1893. Captain Wharton, in reporting on the results of the examination, says that a rim of coral runs round the whole periphery of the bank, 200 miles in length. It lies 9 to 14 fathoms below the surface, and is broken here and there by passages of greater depth, but nowhere so low as the general surface of the bank. At one spot of the rim a depth of only 6½ fathoms was found, and in the centre of the lagoon one spot is only 5 fathoms from the surface. The uniformity of depth is a great argument against any movement of the bottom since the atoll form was assumed, and now the growth of the coral will certainly of itself form, in time, a perfect atoll. The observations of Mr. P. W. Bassett-Smith, surgeon R.N., confirm this opinion. Forty-one genera of corals were represented, excluding the alcyonarian and hydroid corals ; of these twenty-seven genera were found at depths exceeding 35 fathoms, several of which cannot be called reef-building, such as *Leptoseris*, *Psammocora*, *Anacropora*, *Balanophyllia*, etc. Mr. Bassett-Smith concludes that these marine organisms require a much less narrow limit of depth than is usually assigned to them, and that thus the great depths of these lagoons is in great measure explained. Together with these growing corals exists an enormous amount of rock formed by calcareous algæ *in situ*, and probably the coating on the surface of the living tissue protects the rock beneath from the solvent action of the carbon dioxide. In the lagoon very few algæ are to be found. The Echinoderms and Crinoids in the lagoon contain some remarkable new species. Very noticeable is the large number of young specimens; the lagoon seems to be a nursery for these organisms. Holothurians are common on the shallower reefs, but are almost totally absent from the sand-flat of the lagoon. A striking Ophiuroid was discovered, with branched arms like an *Astrophyton*, but possessing plates on its disc which closely resemble those of the ordinary Ophiuroids. To this new genus the name of *Ophiocrene* was given.—*Natural Science*, November 1894.

AFRICA.

Geology of Tunis.—The French mining engineer, J. Aubert, has drawn up a geological map of Tunis. The whole of the east of Tunis up to the frontier of

Tripoli is occupied by Quaternary formations, which extend to the Shott Jerid and to Cape Bon. In the north, Pliocene deposits underlie the Quaternary. Along the coast, near Susa, Hammamet, and in the lower Mejerda they are o marine origin, but in the interior have been formed by fresh-water or sub-aërial forces. Late Miocene rocks are found at Bizerta and scattered over the north-eastern part of the Regency. Eocene rocks—sandstones, marl, and limestones—predominate in the north-west, and in the south between the limestone chains which extend to Kairwan.

The limestones of the Cretaceous system are of great thickness, and form the backbone of the chief mountains of Tunis. Where denudation has taken place on a large scale, as at Zaghuan and at Jebel Jukar, Jurassic rocks crop out. To the south of Gabes the Secondary rocks form large plains sloping to the west-south-west, and at their outer edge Jurassic strata crop out. These are the oldest formations in the country. Eruptive rocks are feebly represented ; rhyolite occurs in the Khrumirie and dolerite at Jebel Ensarnie and Jebel Tabuka.

Timbuktu.—At a meeting of the Paris Geographical Society, M. P. Vuillot exhibited a map of the environs of Timbuktu and Gundam, drawn up by the officers of the Joffre column (*Comptes Rendus*, No. 15). On this map a number of inaccuracies on the map of Captain Fortin, the best hitherto, are corrected. Timbuktu is not situated at the edge of a plateau, but on low ground a few hundred yards from a creek, which in the rainy season loses itself in the inundations which extend along the northern bank of the Niger. Kabara, situated between two small hills, is more than six miles from the river, and is not therefore the port of Timbuktu. The port is really Koriume, lying due south of Timbuktu, and, therefore, a little to the east of its position on Captain Fortin's map. The creek which connects Gundam with the Niger appears at first sight to be an affluent of the river. It is not, however, always such ; during the rainy season it conducts the superabundant waters of the Niger into the lakes of Tele and Faguibine, which stretch to the north-west of Gundam, while, when the water falls in the Niger, the current in the creek changes its direction, and the water flows to the river. The Mount Miziran of the maps is really a vast plateau, commencing about a mile and a quarter from Gundam, and extending northwards to Karao-Kamba, where it is separated by a ravine from the mountain of Farash, a similar plateau stretching northwards.

AMERICA.

The Sources of the Athabasca.—Professor A. P. Coleman of Toronto contributes to the *Geographical Journal* for January an account of a journey he made in July to Mts. Brown and Hooker. He left Morley, on the Pacific Railway just east of the Rockies, and, passing through the foot-hills parallel to the Palliser range, came to the Red Deer River, and crossed a pass 6500 feet high, which brought him to the valley of the Clearwater. The head-waters of the Atikosipi were crossed, and the White Rabbit creek was followed to the Kootenay plains and the river Saskatchewan. From this point the country had hardly been explored at all. Mr. Coleman followed the Cataract river, which enters the Saskatchewan at the foot of Sentinel mountains, and has a course of forty miles to the westward to its source in a beautiful lake of blue-green water full of trout, to which the name of Pinto was given. It lies 5850 feet above sea-level. Crossing a divide 7550 feet high, which he named the Cataract pass, Mr. Coleman came to the Brazeau river, a tributary of the Saskatchewan. In this valley he climbed several peaks above 9000 feet high

and one, at the head of the river, 10,150 feet. By a pass 7700 feet high, named after an Indian chief Jonas, he descended to the Sun Wapta river, a tributary of the Athabasca, and, on reaching Whirlpool river, followed it to its source in a pretty little tarn, the Committee's Punchbowl, which appears on some maps as a lake eight to ten miles long. Its altitude, according to Mr. Coleman's measurements, is 5710 feet, while Moberly gives it as 6025 feet. The valley is interesting, containing several large glaciers, one of them comparable to that of the Rhone.

The only summit which from its position corresponds to Mt. Brown, west or north-west of the Punchbowl, turned out to be only about 9000 feet high. Mr. Stewart and the brother of the author climbed it to within a short distance of the top, where they were stopped by a cornice of snow. The case of Mt. Hooker was less easy to settle. The peak nearest to its position is only about 8000 feet high, but one just east of the Punchbowl probably reaches 11,000 feet, while a few miles to the south-east rise summits perhaps 12,000 or 13,000 feet in height. On the return journey the party made a detour to visit Fortress lake. They made their way back to the Sun Wapta and ascended the headwaters of the Athabasca. The lake is eight miles long by one or two broad, and has water of a pale turquoise blue collected by a few glacier torrents. It has a curious subterranean outlet to the Chaba river (so named by Mr. Coleman), a feeder of the Athabasca, but sends most of its waters to the Wood river, an affluent of the Columbia. The lake stands 4330 feet above the sea, and occupies the summit of a pass. The valley, being on the British Columbian side of the Rockies, displays a richer vegetation than the others. White and black spruce grow to a great height, and aspens, balsam poplars, and willows grow on the plain at the head of the lake ; rhododendrons and heaths cover large stretches on the mountain sides.

The eastern side of the Rockies consists of a series of steeply tilted blocks rising to a height of 8000 or 9000 feet towards the east, and 2000 or 8000 feet higher towards the watershed. They are evidently the result of reversed faults. Eighty parallel ridges, resulting from these faults, are observed along the Brazeau. At the watershed the groups of mountains are less regularly disposed, and sometimes are composed of nearly horizontal strata rising to a height of, perhaps, over 13,000 feet. The rocks, as far as can be determined by fossils, are of Devonian age, and consist of limestones, shales, and slates, underlaid by thick beds of quartzitic sandstones and conglomerates. The time of elevation is post-Cretaceous, for Laramie rocks occur sometimes in the valleys, and Cretaceous rocks were observed near the Brazeau gap tilted into foothills.

Alaska.—Professor George Davidson, Corr. Member, has kindly sent us the following note :—

On the Pacific Coast of the United States, the principal geographical work done by the United States Coast and Geodetic Survey has been in the south-eastern part of Alaska, in connection with the boundary line between British Columbia and Alaska.

Four or five parties have carried the triangulation and the topography up several of the Alaskan streams emptying into the Alexander Archipelago, as far as the three marine leagues line from the continental shores.

The most hazardous journey was that up the Unuk river, through two narrow cañons with rapids. The passage up was made over the shelves of ice ; but, when the work was done, these shelves were gone, and one of the boats was wrecked, with the loss of some instruments, the officers and men being fortunately rescued from the ice-cold torrential stream.

Another party operated upon the Chilkoot river and estuary, and a third upon

the Chilkat river and estuary. The latter reached the astronomical station of the Solar Eclipse Expedition of 1869. The work in this estuary embraced the face of the Davidson Glacier, which forces its way squarely into the deep waters of Lynn Canal, with a frontage of four and three-quarter miles, and the high rocky moraine covered with heavy fir.

Two parties were at work in Yakutat Bay, one carrying forward the triangulation towards the base of Mount St. Elias, the other executing topography, and observing for latitude and longitude at Port Mulgrave. It was this triangulation party which last year fixed the latitude and longitude of Mount St. Elias, and definitely established its height at 18,013 feet. The party also established the geographical position of Mount Logan, about seventeen miles north-east of St. Elias and 19,512 feet above the sea.

An astronomical party was located at Sitka, whence the U.S. steamer *Hassler*, belonging to the Coast and Geodetic Survey, carried chronometers to the parties at Chilkat and at Yakutat for the further determination of the differences of longitude. Sitka has been well connected with San Francisco for difference of longitude by chronometers through several seasons, and by telegraph.

The Alaska Commercial Company of San Francisco has made arrangements with the Indian chiefs near Bering Strait to assist Lord Dunmore to cross the strait on the ice, and to supply him on the Siberian coast with provisions, etc.

Chile.—Dr. Stange, whose journey from Osorno to the lake Nahuel-Huapi was mentioned on p. 95, has sent an account of his explorations to *Petermanns Mitt.*, Bd. xl. No. 11. On January 2nd, 1893, he set out for Moncopulli, 17 miles distant, and travelled over slightly undulating country deeply eroded by the rivers. The Pilmaiquen (Swallow river), which drains the Puyehue lake (Little Fish lake), has formed a gorge 260 feet deep at a point where it falls in seven beautiful cascades. On a later expedition to the west of Osorno, Dr. Stange found still more striking effects of erosion in the longitudinal valley between the Andes and the coast cordillera. On the Tertiary sandstone skirting both sides of the coast cordillera diluvial stone-heaps are found to a depth of 100 feet, covered by a clayey mass which is probably the product of the disintegration of volcanic material. According to D. Barros Arana, the whole Chilian longitudinal valley was once a large lake fed by the melting snows of the cordilleras, which was drained when the existing rivers had broken through the coast cordillera. At the foot of the main chain of the Andes a series of lakes begins at 38° S. lat., which owe their great depth, no doubt, to the powerful agencies of an ice age, and now serve as receptacles for the sediment of the rivers, wherewith in course of time they will be completely filled and obliterated. At Las Lumas, on the way from Osorno to Moncopulli, begins the primeval forest, which extends thence up to the limit of perpetual snow. It consists of beech (*Fagus obliqua*), laurel, myrtle, *Æxtoxicum punctatum*, a variety of the alligator pear (*Persea lingue*), cinnamon (*Drymis Chilensis*), etc. At Aquas Buenas, *Lomatia obliqua*, nuts (*Guevina avellana*), and daphne make their appearance. In the midst of this forest-zone extend for 15 miles the singular moors called *ñadis*, clothed with *coiron* grass (*Andropagon argenteus*), a favourite food of cattle. The slightest fall of rain swells the soil and makes it spongy, so that in rainy winters these *ñadis* are scarcely passable, while in summer they are almost dried up. An astonishing quantity of large aromatic strawberries is found here.

From Aquas Negras Dr. Stange made an excursion to the falls of the Pilmaiquen, where he was shown by a herdsman an enormous erratic block lying hidden in the bush. It measured 49 feet in length, and its highest point was

13 feet above the ground; it was, however, rather deeply imbedded in the earth. A microscopic investigation showed it to be of diorite, of which the mountains near the baths of Puyehue are composed. It can have been transported to its present site only by ice.

A little more than a mile from Aquas Negras is the Puyehue lake, 490 feet above sea-level. It lies in a hollow with gently sloping sides, and the land surrounding its western third does not rise more than 100 feet above it. About the middle the adjoining elevations rise to over 300 feet, and at the eastern extremity form the northern boundary of the Golgol valley running from north-east to south-west. The area of the lake is about 150 sq. miles. On the east the snowy range of the Andes forms a striking background to the green of the forests, the volcano of Puyehue being very conspicuous. At the eastern end of the lake the Chan-Leufu and the Golgol form deltas, the land of which is in part excellent pasturage for cattle, and in part clothed with forest. In the forest are numerous holes digged in old time by the natives to find gold for the Spaniards. In fact, all the rivers and brooks of the Chilian cordillera south of the province of Valparaiso contain gold.

In the valley of the Chan-Leufu, about three miles from its mouth, lie the hot springs of Puyehue, discovered by Molina of Osorno in 1851, and now a much-frequented health-resort. The temperature of the springs varies from 95° to 140° F., and the waters are alkaline. The springs have no connection with the mountain of the same name, from which they are separated by the huge cleft of the Golgol valley. Diorite, melaphyre, hypersthene, andesite, augite-andesite, and plagioclase basalt occur in the neighbourhood.

On his return from Nahuel-Huapi, Dr. Stange made a more thorough survey of the lake. Before the mouths of the Golgol he found large sandbanks covered with five feet of water. The depth then increases down to 230 feet, where three large islands, formerly connected with a ridge running down to the lake between the rivers Chan-Leufu and Pescadero, rise above the surface. The maximum depth is about 650 feet. At the mouth of the Rio Liscan, Dr. Stange found evidence of glacial action. Half of the lake lies in a transverse fold of the mountains, and the other half is imbedded in glacial detritus. According to Dr. Steffen, the periodical fall of the surface is considerable, the difference of level in summer and winter amounting to 3 feet 11 inches; in the last twelve years the water has receded 65 feet from the bank. The lake of Todos los Santos, on the other hand, which lies quite in the mountains, is increasing in volume. This he attributes to a gradual upheaval of the Tertiary rocks of the main cordillera, accompanied by a sinking of the outlying lands. The temperature of the surface water was 62° F.

Riding up the Golgol valley, Dr. Stange came to the limit of forest vegetation at an elevation of 4400 feet. The snow limit varies between this height and 4600 feet. Above the forest stretch extensive bare plains called *arenales*, thickly strewn with lapilli of pumicestone and basaltic lava. In this dismal tract lie four shallow lakes, Las Melissas, in depressions doubtless formed by the subsidence of the masses of lava in the course of cooling. Their icy cold water is carried off westward by the Estero de los Caracoles to the Golgol. The watershed, which Dr. Stange crossed on the flank of the Mirador at an elevation of 4900 feet, probably descends 300 to 600 feet lower, and there Herr Becher has caused a shorter and easier path to be cut through the woods. On either side of the pass rise the mountains Mirador, 5200 feet, on the north, and Pantojo, 5600 feet, on the south. On the Chilian side the ascent is gentle, but very steep on the Patagonian. On the latter, where rain is scarce, the forest-zone lies lower, though

higher than on the Tronador visited by Dr. Steffen, which probably indicates a larger rainfall in the Nahuel-Huapi district. Between the snow-line and the forest stretches a bare desert tract.

Descending the Rio Hondo, Dr. Stange reached the confluence of the Rio Correntoso, which drains the Nahuel-Huapi lake, at an elevation of 2990 feet above sea-level. The latter river has formed a deep gorge between precipitous rocks, where the detritus carried down by the water, and in old times by glaciers, has been piled up in some cases 160 feet high. Before coming to the main lake Dr. Stange passed a small round one, about 360 sq. yards in area, and separated from the larger by a pyramid of detritus.

Nahuel-Huapi means Tiger Island in the dialect of the Huilliche Indians, and is named from a large island lying in its midst which was invisible from the north-west extremity, this part of the lake being connected with the rest by a narrow portal. Though the lake has been frequently the goal of expeditions, the existing maps depict its form very differently. The astronomical determinations prove that its south-western corner must lie to the north of 41° S. lat., and its direction runs from east to west. The north-western corner had never before been visited by a European. It is about three miles long by a half to one mile broad, while the main body of the lake is 12½ miles broad in the middle, and six, on an average, at its eastern end. The surrounding mountains rise on the south up to the treeless zone, and diminish in height towards the west, while on the north they advance to the strait connecting the north-western arm with the main lake. The surface of the water is subject to great variations; during five rainy days it rose 29 inches. Its altitude is 2336 feet. On his return Dr. Stange visited the Laguna del Estanque, lying to the south of the Lago de Rupanco. The latter lies about 10 miles from the Puyehue lake, and the watershed between them rises to a height of 850 feet above sea-level. The surface of the lake lies at an altitude of 330 feet, and the Laguna del Estanque is only about 16 feet higher. Like the Rupanco, it is filled with emerald-green water.

GENERAL.

The Hydrometer.—Professor O. Krümmel of Kiel, in the *Annalen der Hydrographie*, Heft xi., 1894, defends the use of the hydrometer in determining sea-water densities. He considers that the instrument is still indispensable, and that with proper precautions it is capable of giving as reliable results as can be obtained by other methods, weighing with the pycnometer excepted, which, however, cannot be employed at sea. Chlorine titration Dr. Krümmel values highly, but the method is liable to several errors, the most important of which is the uncertainty of the chlorine coefficient, which, indeed, varies in general with the salinity, but also exhibits local differences with waters of the same salinity, as found by Jacobsen in the brackish water of the Baltic Sea.

One of the most important defects of the hydrometer method is connected with the determination of the temperature. The difficulty of establishing a uniform temperature in the hydrometer and through the whole mass of water was alluded to by Mr. W. S. Anderson in vol. x. p. 578, and also in the quotation from Professor Pettersson's letter. Moreover, Admiral Makaroff, in 1891, observed that the thermometer itself caused a disturbance, and Professor Krümmel and Dr. G. Schott made experiments which confirmed the fact. When the thermometer was withdrawn from the water the temperature was 16° C. and the hydrometer reading 1009·98, while the thermometer, on being lowered again, marked 16·1° C. and the hydrometer rose to 1,010·08. The raising of the thermometer 3 cm. was accom-

panied by a fall of the hydrometer to 1,010·02, and a rise was observed when the thermometer was depressed. When the thermometer was lifted quite out, it marked 16·2° C., and the hydrometer stood at 1009·95. The effect of the thermometer diminishes when it has been some time in the water. The explanation of this action is that the thermometer, when inserted, forces the water downwards, causing a contrary current upwards which lifts the hydrometer, while the withdrawal of the thermometer reproduces the currents in inverse order. The observation made by Makaroff that the disturbances are affected by the diameter of the cylinder is quite in harmony with the above facts. If the hydrometer be left untouched it will gradually come to rest, but it takes about a quarter of an hour to do so. As the error cannot always be wholly avoided, Professor Krümmel recommends that the thermometer be enclosed in the body of the hydrometer.

Another error is one well known in connection with thermometers—the unequal contraction after heating, which often takes years to completely disappear. This effect is more evident in a glass containing both potash and soda than in one containing only one of these alkalies. The best kinds are those known as Jena Normal glass and the boron silicate glass. The depression of the zero-point after heating to boiling-point is only ·05° C. in thermometers made of Jena glass, and the zero-point rises to its stable point in three months. The Jena glass has also the advantage of having a very small co-efficient of expansion. Both kinds are good heat-conductors, besides exhibiting great resistance to the disintegrating action of the water.

Differences of readings amounting to ±·0001 often occur with the same hydrometer, sea-water, and temperature. This phenomenon is ascribed by Messrs. G. Karsten and G. Neumayer to capillary action. The stem of the hydrometer is surrounded with a hillock of water rising gradually from the general level of the surface. The error of reading may be avoided by looking from below towards the scale and searching for the line where the plane of the surface meets it. The height and volume of the capillary wave depends on the surface-tension of the fluid. Greasy particles hinder its full development by rendering the wetting of the stem imperfect. Professor Krümmel has found that on hydrometers taken straight out of their cases and placed in the water the wave does not attain its full volume, and therefore the hydrometer does not sink so low and reads too high. It should be rinsed and then wiped several times with a damp cloth.

Professor Krümmel has had a combined hydrometer and thermometer made of Jena Normal glass. It is of the *Challenger* type, with an arbitrary (millimètre) scale and movable weights. Its volume is about 173 ccm., or about 40 ccm. more than that of the ordinary hydrometers. The stem has a length of 12 cm. and a diameter of 1·546 mm. The body of the instrument has a length of 18 cm. and a diameter of 3·6 cm. The thermometer reservoir has a volume of 3 ccm.; and below it is the ballast in the form of a hollow ball partly filled with quicksilver. With this instrument, after it had been duly gauged as Professor Krümmel describes, water from the deep basin east of Gotland was tested, two weights nearly equal being employed, and the mean of eighteen observations was 1009·051±·002; the mean error of a single measurement was ±·008, equal to ±·2 mm. of scale-reading. Another experiment on water from the Gulf of Dantzic gave the mean error as ±017. These experiments were made in a laboratory at a pretty constant temperature, where the scale could be read to 0·1 mm. At sea it could be read only to half a millimètre, which on Professor Krümmel's hydrometer is equivalent to ±·02 of density—a very satisfactory result. Professor Krümmel has also modified E. Abbé's refractometer so as to render it available for density determinations. He has described the instrument in the *Annalen der Hydrographie*, Heft vii., 1894.

Meteorology of the Upper Air.—Last summer Mr. W. A. Eddy of Bayonne, N.J., went to the Blue Hill Observatory for the purpose of obtaining meteorological records by means of kites. Mr. Ferguson, of the Observatory, arranged for him a Richard thermograph, substituting aluminium in the heavier parts, and confining the recording apparatus in a smaller space, so that the instrument weighed only one pound eight ounces. Six kites, in sets of three, lifted the thermograph from the earth, and a base-line 360 feet long was laid off to obtain the altitudes. The first experiments were made on the 4th August, the thermograph starting on its first journey at five minutes past two P.M., and being sent up again at four minutes past four. On August 15th another experiment was made, the kites ascending at 11.46 A.M. The results are all tabulated in the *American Meteorological Journal*, Dec. 1894, and also records taken at the Observatory and valley stations. These show that on August 4th the temperature decreased rapidly for a short distance above the hill, and then more slowly; while on August 15th the reverse of this was true. The relation between the decrease of temperature and the wind and weather has yet to be determined. On the first occasion the wind blew from the west and north-west, with a rising barometer; and on the second occasion the wind blew steadily from the south, and the barometer was slowly falling. The sky was more or less covered on both days. The mean decrease of temperature from the valley station to the highest points reached—1800 and 1500 feet—was the same in both cases, being 1·2° F. for every 300 feet.

On July 31st the kites were let up at noon in a sea-breeze. Four hundred feet above the hill the topmost kite veered round from the west, showing that the depth of the sea-breeze was 1000 feet from sea-level. On August 6th a large cumulus cloud approached the zenith, and a kite, which was then up in the air, suddenly began to ascend almost vertically until all the available cord was let out; it followed the cloud a little past the zenith, and then rapidly dropped to earth. This seems to afford striking evidence of the formation of ascending currents by cumulus clouds.

MISCELLANEOUS.

It is said that Herr Julius Payer, who was leader of the Austrian expedition on the Tegethoff, intends to lead another to the **Arctic regions** in 1896.

On November 8th the Council of Ministers in Egypt adopted the project, with modifications, of M. Garstin for the construction of a **reservoir at Aswân.** This reservoir, it is hoped, will not seriously interfere with the ruins of Philæ.

In the *Boll. della Soc. Geogr. Italiana*, October 1894, is an important article by Signor Olinto Marinelli on the **Italian lakes.** He classifies them in eight groups according to their situation and origin, and shows their distribution on a sketch-map.

The Russian Geographical Society has equipped a scientific expedition for **Central Africa.** Dr. A. W. Yelisseieff is the leader, and he will be accompanied by MM. R. S. Sviaghin and N. S. Leontieff.—*Deutsche Rundschau*, Jahrg. xvii., Heft 4.

Count von Götzen, whose ascent of Mt. Mfumbiro was noticed last month, has **crossed Africa** from east to west. He left Dar-es-Salaam in October 1893, and, passing through the great equatorial forest, followed the Lova to its confluence with the Congo.

Interesting discoveries of **palæolithic implements** have been made in the Rübeland cave in the Harz, which prove beyond doubt the existence of man in these mountains during the diluvial period, contemporaneously with the cave-bear. —*Globus*, Bd. lxvi. No. 24.

An **Antarctic Expedition** is being organised in Belgium. It is to leave Europe in December, and, having explored the region lately visited by the *Jason*, push as far southwards as possible. Should it be impossible to winter in the Polar regions, the expedition will spend the cold season in the Indian Ocean, taking soundings in its least-known parts. The expedition is to be absent eighteen or twenty months.

In the *Annals of Scottish Natural History* there is an article by Mr. Harvie-Brown on the distribution of the **starling** in Scotland. The bird has existed from time immemorial in the Hebrides, the Orkneys and Shetlands, and the north of Caithness. A later migration entered Scotland from the south, through which the districts south of the Grampians were peopled. The earlier movements are chronicled on a map.

In June 1894 the **Balball** or **Dalubi** lake was visited by a German, Johannes, the first European who has seen it. It lies at the western foot of the Meru mountain, on a hill 200 feet high, enclosed by steep rocks. The lake is of triangular form, with the vertex pointing to the south. Its length, from north-north-east to south-south-west, is 1260 yards, and its greatest breadth 875. The water is excellent, and hippopotami are said to live in it.—*Deutsche Rundschau*, Jahrg. xvii., Heft 4.

Dr. E. Richter, Professor at the University of Graz, executed, in October, 120 soundings in Lake **Garda**. The maximum depth in the Austrian part of the lake is 1000 feet, and in the Italian 1135 feet. Though Garda is one of the deeper Alpine lakes, its basin is shallow compared to its length and breadth. The temperature at the surface was 66° F. Between 65 feet and 100 feet it fell rapidly from 64° to 55°, and then decreased gradually to 45·9° at the bottom.—*La Geografia per Tutti*, Nov. 30, 1894.

A reprint of an article in the *Feestbundel*, compiled on the occasion of Prof. Veth's eightieth birthday, describes the **coasts of Java**. The authors, Joh. F. Suelleman and J. F. Niermeyer, state that on the north coast a zone of bush stretches almost unbroken along the shores of Bantam, Batavia, and Cheribon, chiefly composed of mangroves. From a comparison of old maps with modern charts, it appears that in some parts the coast has advanced during the last twenty-five or thirty years as much as three-quarters to one mile. Dunes are found on the south coast, where they extend for a long distance, with a breadth of 500 to 1000 yards.

King Menelik has sent an expedition to the lakes **Suaï**, **Hogga**, and **Orrorecha** (Lamina on some maps). On the islands in the first-mentioned lake were found about 1000 Christians, whose forefathers had fled from the persecutions of the conqueror Mohammed Granye. They have a chief, grow and weave cotton, and live on fish; but they can neither read nor write. The Suaï lies in a volcanic country. It has two feeders—the Maki, coming out of Guraghi, and the Katara, which rises in the Albaso plateau. Its waters flow to the lake Hogga. The third lake, though salt, is connected with the others. Dr. Traversi affirms that the Suaï and Hogga are drained by the Wera (Webi-Sidama) into the Indian Ocean.—*Globus*, Bd. lxvi. No. 23.

The **Eleventh German Geographical Congress** will be held in Bremen from April 17th to 19th. The principal subjects of discussion will probably be as follows :—(1) Polar Exploration, especially the state of the South Polar question ; (2) the chief problems of Oceanography and Maritime Meteorology, as well as the development of charts ; (3) Commercial Geography and Products ; (4) Geography of the German North Sea Coast ; (5) School Geography. Those who wish to take part in the discussion of these questions are requested to forward their papers by February 15th to the Chairman of the Local Committee, Langenstrasse 44, Bremen ; and all others who propose to attend the meeting are desired to intimate their intention to Dr. W. Wolkenhauer, General Secretary of the Local Committee.

The **International Geographical Congress** will be held in London from July 26th to Aug. 3rd. The headquarters of the Congress will be at the house of the Royal Geographical Society, 1 Savile Row, W. The Marquis of Lothian, President of this Society, and Sir William Muir, Vice-President, are Honorary Vice-Presidents of the Congress. The Society will also be represented by Professor Geikie, Mr. J. G. Bartholomew, Mr. Coutts Trotter, and Lieut.-Colonel Bailey on the Honorary General Committee—Professor Geikie and Lieut.-Colonel Bailey being likewise delegates of the Society. Mr. Faithfull Begg is a member of the Organising Committee.

Full particulars respecting subscriptions, meetings, the subjects ef discussion, and a programme of the Exhibition will be found in the circular issued to members of the Society with the January number of the *Magazine*.

NEW BOOKS.

The Portuguese in India ; being a History of the Rise and Decline of their Eastern Empire. By Frederick Charles Danvers, of Her Majesty's Indian (Home) Civil Service. London : W. H. Allen and Co., 1894. Vol. I., pp. liii + 572 ; vol. II., pp. 579.

Mr. Danvers states that it has been his endeavour to trace, *seriatim*, all the principal events connected with the rise of the Portuguese nation and with the development and decline of their Eastern empire ; and he describes his work as a compilation from various Portuguese and Spanish publications, amplified from published, and some unpublished, records of the Portuguese Government relating to India ; from English publications and records of the East India Company ; and, in a few instances, from Dutch publications and records.

There can be no question that these two large volumes are the product of much labour and industrious research ; and yet the result cannot be pronounced to be satisfactory. A large amount of material has been collected, but no effort has been made to select the important facts and to group them so as to form a clear and intelligible picture. Separate incidents are described with much fulness of sometimes picturesque and interesting, though as often wearisome, detail ; but the relations between them are not elucidated, and their bearing on the main theme is left obscure. A distinct impression is nowhere conveyed of what at any one time the empire really comprised, what its character was, and how it was administered. Every event reported in the original authorities is narrated with equal elaboration, but with the result that it is difficult to recognise what is really of importance. To show how nothing found in the original sources is omitted, however little its bearing on the main subject, it may be mentioned that we are told

that the explorers who were sent out by the King of Portugal, in 1481, to search for Prester John, "were granted for their expenses a sum of 400 crusados, one half of which they received in cash and the other half in bills on Naples." Again, after reading a whole page devoted to an account of the exploration of a remarkable labyrinth in the island of Salsette, one is rather surprised to find it stated in a note that the account of the labyrinth is believed to be entirely apocryphal. It is in fact the invention of a mendacious traveller, and, had the materials been critically dealt with, would have been omitted altogether. One is left with the feeling that very possibly some of the other narratives which are taken from the same or similar sources are equally untrustworthy; and at times, when reading some of the descriptions of the fearful cruelties perpetrated by Portuguese officers, one hopes, for the credit of human nature and of the Portuguese nation, that this is the case. Of course, the extraneous matter to which we refer is not devoid of an interest of its own, psychologically or otherwise. Such, for instance, is the account of the embassy sent to Pope Leo X. in 1511, to announce the Portuguese victories and present some of the captured trophies. Our objection is that, handled as they have been, these details interfere with the general effect. It is noteworthy, also, that almost all the names of Eastern potentates and places, and vernacular words generally, are given in forms so corrupt and disguised that it is occasionally impossible to guess who is meant, and certainly the pleasure of reading is greatly marred. The volumes, in short, contain a mass of materials of varying quality that may be extremely useful; but if any one who is not already at home with the subject wishes to have a clear conception of the rise and nature and fall of the Portuguese Eastern empire, he will get this more readily from the admirable volume devoted to Albuquerque in the series of *Rulers of India*. With that as a guide, he will then find much to interest him in the volumes of Mr. Danvers.

The Empire of the Tsars and the Russians. By Anatole Leroy-Beaulieu. Translated by Z. A. Ragozin. Part II.: The Institutions. New York: G. P. Putnam's Sons, 1894. Pp. ix + 566. *Price* 12*s.* 6*d.*

Our general remarks on the first volume of this work hold good of the second also. There are the same interesting and lucid mode of presenting fact and conclusion, the same keen perception and analysis and wealth of illustration, and, on the part of the translator, a freedom in the style that makes us forget we are not reading the original, even although traces of Americanisms and of expressions barely literary are still discernible.

M. Leroy-Beaulieu has here dealt with a difficult, even dangerous, subject, yet a fruitful one. He examines Russian institutions, central and local, judicial and political, and estimates their effect. The great question for Russia is one which the official Russian may not allow: can the old Russia, as we know her—autocratic and bureaucratic—live on side by side with the modern forces that press in upon her from without, and are not unknown even within herself? The *mir*, truly Russian and yet not purely so, suggests the question at the outset, but hardly provides the solution. "The example of Russia shows that communal and political liberties can be separate things, without a connecting link." In Russia they are not based on the same principle. In parliamentary institutions respect for the individual is the predominant basis, in Russian local self-government respect for the community; and hence "these puny democracies, which merge the individual into the community, have trained the Russian people as much to despotism as to liberty." Still, the Russian has derived from the experience of the commune, as

M. Leroy-Beaulieu remarks, a concern for and in his own affairs, and the habit of co-operation with his fellows—aptitudes valuable in themselves, and valuable, too, for the preliminary training they supply for the exercise of a true political liberty whenever it may come. The author's treatment of the *mir*, expository and inferential, is but a specimen of that discernment he brings to bear on Russian institutions in general. It is in the *zemstvo*—the territorial assembly, representative of all classes—that he discovers most hope—"the corner-stone," he calls it, "of all future institutions of the empire; anything rational and durable that may be done must be based on that." Decentralisation, carrying with it real, effective powers of government, but not necessarily alien to Russian foundations, is called for to-day with a unanimity very significant in discordant Russia. There is no lack of M. Leroy-Beaulieu himself in this volume, and he is always suggestive, even when he is not conclusive; but neither is there any lack of material for drawing conclusions of one's own.

Die Liparischen Inseln. 3tes Heft. Lipari. 8tes Heft. Allgemeiner Theil. Prag: Heinrich Mercy, 1894. Pp. 158 and 159.

A princely work by one who knows the Liparis well. Never were islands so carefully described or so splendidly illustrated. In the eighth volume, the illustrious author discusses the islands' climate, physical surroundings, population, agriculture, bee-keeping, silk and cattle trades, sport, fishing, navigation, mining and manufactures, commerce, hotels, and postal and telegraph systems, so that intending tourists to the Liparis will find everything narrated here. This volume should be published in a handy form for the tourist, and, if in the English language, we are sure that the Liparis would soon attract British travellers. "The character of the Liparotes," says the author, "is gentle and amiable. Robbery and murder, of which so much is heard in the neighbouring Sicily, are unknown in the Liparis. The stranger may go with perfect security among these agreeable, lively, happy people, who will win his heart immediately. He will soon find himself quite at home among them, for they display a peculiar, I might almost say childish, confidence. This is particularly marked among the young girls, who stray alone far up the heights, where they sing and play in joyful innocence."

A travers la Russie Boréale. Par Charles Rabot. With 61 engravings and 2 sketch maps. Paris: Hachette and Cie., 1894. Pp. 316.

This is the record of a journey made by a field-naturalist from Kazan *viâ* Perm and Tcherdin to the head of the Petchora, then down stream to Ust Shtchugor; he then followed the Shtchugor up stream, crossed the Ural mountains to the Sygva, which brought him to the Sosva and so to Berezov; hence he ascended the Ob and the Irtish to Tobolsk, and travelled by road to Tiumen, where he reached the railway, and practically ended his wanderings. Besides being brightly written the volume contains in small compass a great deal of general information, for the author does not confine himself to personal observations, but gives summaries of what he has picked up in books. A chapter or piece is devoted to the manners, customs, etc., of the Tcheremiss, the Tchuvash, the Permians, or Lyrians, and the Ostiaks, among whom he includes the Voguls. In every case he bases his facts on good authorities, though he is mistaken in believing that the Vess of Nestor and Arab authors have disappeared from the map. Under the name of Veps they still occupy the same territory as of old—the shores of Bielozero.

Of geographical interest are his remarks on the gradual shifting of the bed of the Lower Kama from south to north. Within historic times it has moved some 20 kilometres, for the old left bank can be traced at Spask, not far from

the site of the ancient Bolgari. East of the Urals the movement is from west to east, and the Ob is visibly working its way in that direction. The great difficulty attending the crossing of the Upper Ural range lies in the boundless morasses where there is not a foot of firm ground for hundreds of miles. It is so great that practically there is no communication between the two sides except in winter. The cause of these endless swamps is not far to seek. Only a few inches below the surface the ground is frozen as hard as iron, and no surface water can percolate. M. Rabot would probably not have been able to cross without the assistance of the all-powerful M. Siberiakov, who had horses waiting for a whole month to transport the party from the head of the Shtchugor to the valley of the Sygva. With this exception, and a short portage across the watershed between the Kama and the Petchora, the whole of the long journey from Kazan to Tobolsk was made by water, either in a steamer or by a boat with oars. An attempt to ascend Telpos Is, the highest point (over 1600 meters) in this part of the Urals, failed, owing to a violent storm of rain, followed by heavy mist. M. Rabot does not believe the Trans-Siberian railway can ever be used as a commercial route for the transport of heavy goods, such as agricultural products, on account of the heavy transport rates, though it will assist the colonisation of the country. What he looks forward to is the establishment of a line of steamers from the Ob and Yenisei to some European port, as the best and only means of transporting grain cheaply from the vast interior of Siberia. The volume closes with a list of the insects, molluscs, and plants collected during the excursion.

Der Montblanc: Studien im Hochgebirge, vornehmlich in der Montblanc-Gruppe. Von Paul Güssfeldt. Berlin: Gebrüder Paetel, 1894. Pp. 276.

Although the Mont Blanc group forms the chief subject of study in this volume of Alpine papers (from the *Deutsche Rundschau*), the author also relates his investigations of the Pennine Alps, the Bernina group, and the Graian Alps, and furnishes details of heights, glaciers, and passes by means of diagrams, which very clearly, if not very elegantly, illustrate his subject. Beautiful photographs, and an excellent map of the Mont Blanc group, are also given. In order to express succinctly the details of the once remarkable (but now common) ascent of Mont Blanc, Herr Güssfeldt gives one of his own ascents briefly in the following six stages from the hut to the summit, viz.:—

	a.m.	a.m.	Mètres.	Nature of Ground.
I.	2.18—	3.18	3370—3650	Steep snow-field (steps cut).
II.	3.18—	4.45	3650—3810	Snow-plateau, crevasse, rocks, snow-field.
	(including 16 mins. halt)			
III.	4.45—	5.15	3810—3845	Crossing an ice-slope.
IV.	5.15—	8.50	3845—4400	Climbing the great lower rock-mass.
	(including 54 mins. halt)			
V.	8.50—	10.37	4400—4700	Snow-slope and edge, the small upper rock-mass, and the highest lateral snow-ridge.
	(including 10 mins. halt)			
VI.	10.37—	11.8	4700—4810	Peak of Mont Blanc.

After resting in the tunnel constructed in the peak by direction of the Swiss engineer Imfeld and the French physicist Janssen for the purpose of erecting an observatory, Herr Güssfeldt, instead of returning to Chamonix, went on to the "Aiguille Grise" by the "Refuge Vallot" and the Glacier du Dôme, resting in the "Dôme Hutte." Next day the Glacier de Miage was traversed and Courmayeur was reached, thus completing an expedition which, for a combination of beautiful and grand scenery, is the most delightful the author ever made.

From the Clyde to the Jordan. Narrative of a Bicycle Journey. By Hugh Callan. London: Blackie and Son, 1895. Pp. 312.

Setting forth from Glasgow on his bicycle, Mr. Callan made a trial trip to Carlisle, then travelled by rail and steamer to Paris, whence began the unbroken bicycling part of his remarkable tour. Traversing France, Switzerland, Austria, and Servia, he passed through Bulgaria, and reached Constantinople. Then he wheeled through Asia Minor, under the shadow of the Mysian Olympus, through fair and fertile Phrygia, over the Desert of Salt, up the Bull's side (the Taurus), across sunny Cilicia, and after a voyage to Jaffa his bicycle was broken by a native, and he drove to Jerusalem. He was away four months, and the total distance done on wheel was about 2800 miles. He left Glasgow with £50, and he returned with £6, half of his outlay being for rail and steamer—showing how cheaply the bicyclist can travel compared with other tourists.

A "Scot abroad" himself, the author found a friend in need, when in difficulties in Belgrade, in another Scot—Mr. Maclure, originally from Glasgow, but now an important Servian official. He also tells us of another Scot, Mr. Mackenzie, who has figured largely in Belgrade's recent history as "a capitalist, a philanthropist, and withal a martinet." It is to him that Belgrade owes its handsome "English quarter," originally a tract of land which Mackenzie bought, and on which he built houses for rich and poor.

Mr. Callan's book is lively, interesting, and instructive, and the illustrations are numerous and excellent. If the author's route and sleeping-places had been indicated on the map, it would have been useful to bicyclists who were desirous to emulate his example.

St. Michael and Inveresk. Edited by James Wilkie, B.L., S.S.C. Edinburgh and London: Oliphant, Anderson, and Ferrier, 1894. Pp. 216. *Price 3s. 6d.*

This handsome volume has been published in aid of the renovation, internal and external, of the Inveresk Parish Church. Though intended to serve an occasional and temporary purpose, the book contains many elements of permanent interest in connection with local history and topography. We learn from it, for example, that the parish church, the church of "Jupiter Carlyle," occupies the site of an earlier and very ancient church of St. Michael, in the erection of which the remains of a Roman municipium were freely used; and that a temple of Apollo occupied the same site. Sound reasons are adduced by Dr. Cooper of Aberdeen, and by Mr. Carrick of Newbattle, for recognising St. Michael—the Taxiarch, or leader of armies—as the patron-saint of Inveresk, as he is also of many other places in Scotland, where the St. Michael churches and the Kirkmichael parishes are numerous and memorable. Besides interesting biographical notices of Dr. Carlyle and Lord Hailes, the volume contains literary contributions by S. R. Crockett, Annie Swan, and others. The introduction, by the present minister of Inveresk, is disfigured by some rather glaring solecisms. The illustrations are good, especially W. D. M'Kay's "On Solway Sands." Much praise is due to the editor, Mr. James Wilkie, B.L., S.S.C., who contributes the article on Dr. Carlyle.

Voyage en France. II^e^ Série. Par Ardouin-Dumazet. Paris: Berger-Levrault et Cie., 1894. Pp. 334. *Price 3 fr. 50 c.*

The author devotes this, the second series of his *Voyage*, to Anjou, Bas Maine, Nantes, Basse Loire, Alpes Mancelles, and Suisse Normande. Whether describing the manufacture of liqueurs or of rosaries, M. Dumazet is always grave, practical,

interesting, and exact He evidently writes, not to amuse or surprise his readers, but to give them reliable information regarding France and the French people. This work will, when completed, be of great value as a present-day photograph of one of the wealthiest and most industrious nations in the world. Maps would have perfected the *Voyage*.

The Story of Australian Exploration. By R. Thynne. With Illustrations and a Map. London : T. Fisher Unwin, 1894. Pp. 277. *Price* 5*s*.

It was probably with the intention of lending to his pages more living interest that the author adopted the plan of representing himself under the name of William Boffin, a sailor (as we understand he is) and almost illiterate (which he certainly is not) assisting in several of the expeditions by which so much of Australia was opened up. We have failed to find the name of Boffin, for instance, among those of the parties which accompanied Sturt and Eyre. Nevertheless, Mr. Thynne has closely adhered to fact, so that his narratives may be taken as almost wholly authentic ; and his story will be found interesting and instructive by those who desire to learn something of the broad features of the progress of exploration in Australia, without burdening themselves with the minor and more minute details, or the results of scientific investigations. It is well, also, to have the details of the various journeys here noticed brought together in a single volume of handy size. The author writes in a free, breezy style well suited for his theme, and has performed the somewhat difficult task of consistently looking at the problems presented to the pioneers from the point of view of the period, and not from that which a wider knowledge of the country now leads us to adopt. The illustrations are fairly good, while the map, if rather small, will be found handy for reference, as it has the routes of the different explorers clearly marked.

Notes sur la Norvège. Par Hugues le Roux. Deuxième Édition. Paris : Calmann Lévy, 1895. Pp. 320.

The author discusses the Norwegians, their manners and customs, in the light style so popular in France. It is to the people engaged in the active industrial life of the towns, rather than to the rustic denizens of the inland valleys, that these notes apply ; and the Sagas and modern plays are largely drawn upon—too largely, it seems to us—to illustrate the Norwegian character. Nor are the traits chosen for illustration always peculiar to the Norwegians, but many are common to northern races or are a consequence of the social changes taking place in Europe generally. That "un Scandinave se tue presque aussi facilement qu'il part en voyage" is a statement not borne out by statistics.

The book is a very readable one, the style being agreeable, though once or twice becoming fantastic, as in the description of the Vrangsfos. As in many French books, foreign words are sometimes incorrectly spelled ; for instance, we find *Gard* for *Gaard*, *Tralasthandler* for *Tralasthandler*, *Kepfisk* for *Klipfisk*.

Our Journal into Scotland, Anno Domini 1629, 5*th of November, from Lowther.* C. Lowther, Mr. R. Fallow, Peter Mauson. Edinburgh : David Douglas, 1894. Pp. 56.

This pamphlet—for it is no more—belongs to the same series as *The Early Travellers in Scotland*, and the *Tours in Scotland* by Thomas Kirk and Ralph Thoresby, both of which, as edited by Mr. Hume Brown, were valuable contributions to the early history of the country. The author was undoubtedly a member of the Lowther or Lonsdale family, as the ms. was found at Lowther Castle. It has already appeared as an appendix to the thirteenth report of the

Historical Manuscripts Commission, under the editorship of Mr. J. J. Cartwright. It is now produced for the first time in separate form, by permission of the Earl of Lonsdale. Mr. Cartwright supposed the author to be the Rev. Christopher Lowther, who was afterwards rector of Lowther; but as the writer refers expressly to "my uncle Fallowfield," a brother-in-law of the rector, the present editor suggests, with good reason, that he was Sir Christopher Lowther, who died in 1644, and thus at the date of the tour would be a youth of some twenty years of age. The booklet is little more than an itinerary of a three weeks' tour in the South of Scotland, which lasted from November 5th till November 26th, 1629. The party came from Lowther to Edinburgh by way of Carlisle, Langholm, Selkirk, and Galashiels. After spending four days in Edinburgh, they went to Perth by way of Burntisland and Kinross. They then returned to Edinburgh, where other two days were spent, and returned to Lowther by way of Galashiels, Baytingbush, Arthuret, and Bleckhill. The journal is at once bald and matter-of-fact in character, and distinctly juvenile in tone; but the writer's description of the law-courts in Edinburgh, which is accompanied by a unique plan, is valuable, and indicates a familiarity with the practice and procedure in the English courts which would be surprising in a youth of twenty if he had not been trained to the law. His account of the curriculum in the University of Edinburgh is also very interesting. It is curious to find the title of Dean of Guild transformed into Danegeld. The editor's notes are copious, well-informed, and exact.

Voyages and Travels of Captain Basil Hall, R.N. With Illustrations. London, Edinburgh, and New York: Thomas Nelson and Sons, 1895. Pp. 387. *Price* 4*s.*

The faults of the original narrative were those of the period, when all authors, whatever their subject, were expected, and seldom failed, to preach and moralise as they went along. And Captain Hall preached at exceeding length and with a dryness almost superhuman. The editor of the handsome volume now before us has omitted these wearisome digressions, as well as a number of details interesting and useful enough at the time, but dealing with matters which have now become obsolete, with the result of producing a fresh and fascinating record of travel and adventure. The scenes described principally took place during the stirring period of the Peninsular War, and both afloat and ashore Captain Hall witnessed much of interest, and took part in many a deed of daring. He was present, as a spectator, at the Homeric combat at Corunna, and his description of that battle is vivid in the extreme. But the chief charm of the work appears to us to lie in the realistic pictures of life on board a man-of-war of the period; they are excellent, and make delightful reading: the description of the chase of the French privateer off the coast of Ireland might have been from the pen of Marryat. We have not for a long time seen a volume that should make a more welcome present for an intelligent and thoughtful lad. The numerous illustrations are the least successful part of the volume, which is clearly printed and handsomely bound.

On and Off the Saddle: Characteristic Lights and Shadows from the Great North-West to the Antilles. By Lispenard Rutgers. New York and London: G. P. Putnam's Sons, 1894. Pp. 201. *Price* 2*s.* 6*d.*

A neat little book, containing many graphic descriptions of North American scenery, people, and customs, the most remarkable papers being, perhaps, those headed "A Mexican Cock-fight," "Bull-fighting in Mexico," and "A Western Cyclone." The last-mentioned calamity is described as hurling houses, animals, and

human beings into the air. "Every conceivable kind of household furniture, clothing, food, merchandise, dry goods, hardware, and farming implements were mixed in with the bodies and dismembered victims, some dead, others so wedged among the rubbish as to be unable to be released. Such a sight can never be obliterated from the memory of one who has ever witnessed it."

Sporting Days in Southern India: being Reminiscences of Twenty Trips in pursuit of Big Game, chiefly in the Madras Presidency. By Lieut.-Colonel A. J. O. Pollock, Royal Scots Fusiliers. London: Horace Cox, 1894. Pp. xx+252.

This volume is almost exclusively a record of sport, but the writer's adventures are very well told, and many of them amusing as well as exciting. Incidentally, too, he gives a good deal of information as to the character and habits of the larger animals—elephant, bison, tiger, panther, and bear—both in their ordinary condition and when attacked and wounded, and the nature of the country they generally frequent; with detailed practical advice to sportsmen as to the weapons to be used, the vulnerable parts of the quarry, the proper mode of approach, and other matters. He seems to doubt the wisdom of the prohibition now in force in Madras against killing elephants, as the damage done by them, now that they are aware of their impunity, is greater than ever. He refers to the tiger's habit of covering up his "kill" during the heat of the day with leaves, to keep off the vultures (which he frequently catches and kills). The man-eater, instead of leaves, uses, the author says, the clothes of his victim, which surely must, usually, hardly suffice for the purpose. There are also, he says, man-killing bears, the habit being, apparently, only a whim or fashion, as they do not eat their victim. In short, the generally harmless character of the bear, and the ease with which he is shot, and absence (with ordinary precaution) of danger, make him, the author thinks, hardly a worthy object of pursuit. Of bisons, as well as tigers, he asserts that they often, especially in districts where they have not been much disturbed, suppose the flash and report of a gun to be thunder and lightning. A herd of bison will merely start when they hear the gun, and resume feeding; and a tiger, when fired at on approaching a bait, often does not, unless hit, appear scared by the shot.

The writer describes various districts, from Mysore southwards to Cape Comorin, where especially good sport is to be had, with details as to routes and expenses.

Western Asia, according to the most recent Discoveries. Rectorial Address on the occasion of the 318th Anniversary of the Leyden University, 8th February 1893. By C. P. Tiele. Translated by Elizabeth J. Taylor. London: Luzac and Co., n.d. Pp. 36.

The subject of this address was the contents of the Tell el-Amarna tablets. As is pretty well known, these consist of the correspondence between Amenothes iii. and iv. and various Asiatic potentates and Egyptian governors stationed in Syria. The most remarkable fact is that the language and script are both Babylonian, at a time, too, when Babylon was governed by a Kassite dynasty and was of small importance. Professor Tiele attributes this to the fact that the Phœnician alphabet was not in general use.

In this connection is mentioned, for the first time, the people called Habiri, who caused the governor of Urushalimē (Jerusalem) considerable alarm. Some have supposed these were the Hebrews, but the Professor points out that from a linguistic point of view not much can be said for this opinion. At the same time, however, there are letters from the governor of Tunip, near Aleppo, who speaks of the soldiers of Juda whom he has driven out of the city. The difficulty of identi-

fying these two tribes or peoples with the Hebrews is that all this took place in the eighteenth dynasty, a long time before they are generally believed to have entered Canaan.

The learned Professor notes that *Ilāni* was used in the plural for God, just as *Elohim* was used by the Israelites at a later period. This is followed by some interesting remarks on the religion of the Semitic and Allophyle populations in Syria, Mesopotamia, Mitani, and Babylon.

The Story of the South Seas. By George Cousins, Editorial Secretary, London Missionary Society. With Maps and many Illustrations. London : John Snow, 1894. Pp. 246.

This small quarto volume is a popular narrative of the Christianising and civilising of the natives of Polynesia during the nearly hundred years since, in August 1796, Captain James Wilson, in the good ship *Duff*, led thirty missionaries to Tahiti. Wilson himself had been a sea-captain in the East India trade, and a prisoner of Haidar Ali and Tipu Sahib, from whom he escaped after the most extraordinary adventures. Mr. Cousins should have consulted that rare little book, *The Conversion of Captain James Wilson*, printed by Colston of Edinburgh in 1836 to help the Deaf and Dumb School. Of the thirty missionaries, four were ministers and six were carpenters ; the others were shoemakers, bricklayers, tailors, smiths and weavers, a surgeon, a hatter, a gentleman's servant, a cooper, a butcher, etc. None of these was properly trained at that early time, and few, therefore, proved equal to the trials which met them. But they began a work which has gradually produced the results eulogised by so good an authority as R. Louis Stevenson. Mr. Cousins' book is lacking in clearness for want of such a background, geographical and ethnological, as Dr. Codrington's big volume or Mr. Whitmee's little one would have supplied. He shows the usual English ignorance of Scottish Church effort in Melanesia, making this extraordinary statement : "Mr. Williams entered into an agreement with the United Secession Church in Scotland (now merged in the United Presbyterian Church)." The writer should have said,the Reformed Presbyterian, since merged in the Free Church of Scotland.

Emin Pascha und die deutschen Besitzungen in Ostafrika. Von Gustav Uhl. Leipzig : Verlag von Gustav Uhl, 1894. Pp. 39 and Appendix. *Price* 50 *Pf.*

The author is not very accurate in his knowledge of Emin Pasha, or he has too rapidly condensed information read in various books. There is nothing new here ; and, indeed, the form of what is given seems very familiar. That matters little, however, as the main portion of the brochure is taken up with an account of the rise and vicissitudes of the German colonial schemes in East Africa. It is accurate but not exhaustive.

Die deutschen Schutzgebiete in ihrer wirtschaftlichen Entwickelung bis zum Jahr 1893. (Nach amtlichen Quellen.) Leipzig : Verlag von Gustav Uhl, 1894. Pp. 68. *Price* 80 *Pf.*

No author's name is given to this production, which is, however, evidently from the pen of a man who longs to see the extension of German colonies, and who regrets the number of Germans who leave the Fatherland for America. It is a sketch of the various German colonies, and gives brief details as to their condition and productiveness. Steady progress seems to be shown, and, no doubt, the book will have the effect wished for by the author in pressing colonial claims upon the attention of his countrymen.

Stanford's Compendium of Geography and Travel—Australasia. Vol. II.: *Malaysia and the Pacific Archipelagoes.* Edited and greatly extended from Dr. A. R. Wallace's *Australasia* by F. H. H. Guillemard. Map and Illustrations. London: E. Stanford, 1894. Pp. xvi + 574.

It is unnecessary to dwell in detail on the plan of contents of this well-known series, which was modelled originally on the work of Von Hellwald. Taking each region or group of islands in its turn, we have some notice of its physical geography, of its natural and cultivated products, and of the ethnology, with the manners and customs of the inhabitants and a sketch of their history. Fifteen years have elapsed since the appearance of Dr. Wallace's work; and besides the desirableness of bringing statistical information up to date, exploration and fuller investigation have added a good deal to the information available in many of the regions described.

On comparing the present with the former edition we find the alterations in the text, as well as the additions, which are very considerable in amount, made with much care and judgment; the Natural History has met with special attention, as might be expected in a work produced under Dr. Guillemard's auspices. In his description of Easter Island he might have referred with advantage to the account in the *Smithsonian Institution's Reports* for 1889; and on the subject of the Mentawi Islanders and the interesting question of their language and race affinities, we imagine there is later authority than Rosenberg's. We note the omission from this edition of Professor A. H. Keane's "Ethnological Appendix," though Dr. Guillemard recognises the high authority, on such matters, of that writer.

The first edition also contained a list of the authors to whose works the compiler was indebted. This, we think, might have been retained and supplemented.

Europa: Eine allgemeine Landeskunde. Von Dr. A. Philippson und Prof. Dr. L. Neumann. Herausgegeben von Prof. Dr. Wilhelm Sievers. Leipzig und Wien: Bibliographisches Institut, 1894. Pp. 635. *Price* 16 *M.*

The fourth volume of this admirable series, and, like the others, carefully written and beautifully illustrated, *Europa* is divided into three parts, viz.:—1. General Remarks, Physical Features, and Climate; 2. Flora and Fauna, Population, Different States, and Commerce; and 3. European Polar Regions. Germany is illustrated by a series of special maps exhibiting the distribution of religious faiths, density of population, agricultural products, etc. A map based upon rental, like that of France by the late Prof. Delesse, would have completed the series.

Turning to Great Britain, we find special maps illustrating density of population and mineral and industrial districts. The following paragraph will show how Scotland is described in the second part: "As already stated, the greater portion of the population of Scotland is centred in the Lowlands, in the district between the Forth and Clyde, whilst the remaining territory is sparsely peopled. This is especially marked in the growth of the greater towns. *Dumfries* (17,800 inhabitants) on the northern coast of the Solway basin, and *Hawick* (19,200) on the upper Tweed, both near the English border, are the only important towns. In Central Scotland, again, *Ayr* (25,200), *Greenock* (63,400) on the Clyde, *Paisley* (66,400) and, above all things, *Glasgow*, with suburbs (772,000 inhabitants), have achieved importance as industrial and commercial towns similarly to numerous English towns enjoying the same advantages. Since sea-going ships have been able to reach it, Glasgow has become the second city of the Empire, and has gone far ahead of the Scottish capital *Edinburgh*, near the Firth of Forth, although it and its port, *Leith*,

have become blended into one place of residence (330,000 inhabitants). In this we see the contrast between the east and west coasts of Britain, as concerns the commerce of the world, the latter having gradually become much the more important. As the remainder, however, of the Scottish west coast is precipitous, barren, and difficult of access, all the other chief towns of Scotland are on the east coast, wherever circumstances have led to their formation, as at river estuaries or at places suited for navigation. Thus *Stirling* (16,800 inhabitants) is at the farthest corner of the basin of the Forth, and *Perth* (29,900) is at a suitable point on the Tay, whilst at that river's estuary we find *Dundee* (154,000), an important centre of the linen industry, shipbuilding, and Arctic commerce. *Aberdeen* (120,000 inhabitants), *Peterhead* (12,200), one of the headquarters of the herring fishery, *Inverness* (20,900), and *Wick* (8500), are the most northerly of the chief commercial towns of Scotland. The Scottish Highlands, with their bare and dark glens and numerous gloomy lakes, contain only a small population, chiefly engaged in sheep-farming. This and fishery are also the employment of the inhabitants of the Hebrides, and Orkney and Shetland Islands, the capitals of which are *Stornoway*, *Kirkwall*, and *Lerwick* (each of from three to four thousand inhabitants), but in which the density of population (20—30) attains higher dimensions than in the most northerly counties of the Scottish Highlands."

As an attractive, instructive, and suggestive volume on Europe, we do not think *Europa* could easily be surpassed. We hope it will be translated into English.

The Physical Geology and Geography of Great Britain. By the late Sir Andrew C. Ramsay. Sixth Edition. Edited by Horace B. Woodward, of the Geological Survey. London: Edward Stanford, 1894. Pp. xv + 421.

It is sixteen years since the former edition of this well-known work was published, and the publisher has been well advised in issuing a new one. The task of revision has been intrusted to Mr. Horace B. Woodward, F.G.S., who has based the plan of the present work on the fourth edition—a much more compact and satisfactory one than the fifth—amended the statements which required modification, and added information of recent acquisition. The book is therefore reliable, and it is likewise readable. It will be perused by those knowing somewhat of geology for its suggestiveness, with even greater zest than by the tyro with the massive hammer, who, however, would do well to consult it if his interest is in more than mere rock-chipping and collecting.

The geological map is clear and well printed, but on a ridiculously small scale.

Elementary Commercial Geography. By Hugh Robert Mill, D.Sc., F.R.S.G.S. Second Edition, Revised and Enlarged. Cambridge: At the University Press, 1894. Pp. 196. *Price* 1*s.* 6*d.*

In its second edition, Dr. Mill's *Elementary Commercial Geography* appears in an enlarged form, its bulk having been increased by one-half of its former size. The book has been thoroughly revised in detail, and the enlargements do not consist so much in new sections as in important additions in every chapter. The information has been brought down to date by reference to the most recent official publications. The principles of Commercial Geography receive fuller treatment, and special attention is given to the partition of Africa among the European Powers. Not the least valuable of the additions to the book is a very full alphabetical index. The contents also are set out with greater elaboration. If the book was valuable before on account of its accuracy, its methodical arrangement, and the clearness of its style, it must be much more valuable in its new form.

Commercial Geography. By E. C. K. Gonner, M.A., Brunner Professor of Economic Science at University College, Liverpool. London: Macmillan and Co., 1894. Pp. xii + 206. *Price* 3*s*.

Messrs. Macmillan have added to their Elementary Commercial Class-books a volume on *Commercial Geography*, by Professor Gonner of Liverpool. It is a very thorough piece of work. Indeed, it is so full of facts, that, if the matter were not very methodically arranged, it would be difficult to follow the lines of thought. As it is, the book is by no means an easy one to read. The first section deals with the physical and political influences which control commercial progress, and the conditions of industrial and commercial development. All this is introductory. In the two remaining sections the subject is treated in two different ways—first, according to products; secondly, according to countries. The book closes with a table of moneys and a good index.

Neue Erdkunde für höhere Schulen. Von Dr. J. J. Egli. 8te, verbesserte Auflage St. Gallen, 1894. Pp. 244.

The Zurich Professor prefixes his book with the motto, *Non multa, sed multum*, and he succeeds wonderfully in applying it, considering the multifariousness of his subject.

The book is brightly and interestingly written, and the pictures presented of the various countries are precise, and on the whole fair. But in a few pages it is hardly possible to convey a complete and accurate account, and vividness is sometimes attained by statements which require some qualification. For instance, five pages are allotted to the British Isles, and in them is an account of the strict Sunday observance in the United Kingdom. But the picture of the houses being all shut up on Sunday, no children's play tolerated, no visiting permitted, and of regular attendance at two diets of worship, while the post-office is completely functionless, is that of an ideal rather than of a reality. One cannot glance through such a geography, however, without wondering why such interesting works never found their way into our schools when we were pupils, and envying the scholars whose lot it is to use such text-books.

Elementos de Geographia Geral. Por Carlos de Mello. Lisbon: Typographia do Commercio, 1894. Pp. 497-808.

The first and second parts of this work were noticed in vol. x. p. 554. The last part deals with Biological and Political Geography, the former treating of vegetation and animals, their distribution and its causes, and of man and the races into which he is divided. For the flora the classification of Van Tieghem is adopted, for the fauna that of Clauss, and for man the tables of Broca and Topinard and the areas of Dr. Gerland have been employed.

In the section devoted to Political Geography we find the political organisation of each country, its administrative divisions, its industries and commerce, areas, temperature, etc. A few mistakes occur; for instance, England and Wales, Scotland and Ireland are said to be each under a Lord-Lieutenant, and Salford, Manchester, and Liverpool are all placed in Chestershire (*sic*). But it is hardly to be expected that a book containing such a mass of information should be absolutely correct in all its parts, and the above are errors of no great importance.

As a whole it is a most useful work, and is highly to be commended. The facts are not set forth by themselves, but are shown to be the causes or effects of natural agencies, so that the understanding of the student is called into play and not his memory alone. The work has been written specially for the instruction of pupils

in the colleges of Portugal, who are often very badly prepared for the course, and contains all the items in the official programme, or we should have suggested that a chapter on the commercial geography of the world would be a useful addition.

Carte des Sédiments de Mer Profonde, avec Notice explicative. Par JOHN MURRAY et A.-F. RENARD. Bruxelles: Société Belge Librairie (Société anonyme), 1894. Pp. 45.

The map is a reproduction of that issued with the *Challenger* "Report on Deep-Sea Deposits," and clearly shows the areas occupied by each deposit, as well as the depths of the oceans. It is very tastefully and distinctly tinted, little difficulty being experienced in distinguishing the colours by ordinary artificial light. The letterpress, of an explanatory character, is sufficient for the use of the general inquirer: those wishing fuller and more exhaustive information must consult the "Report" itself. The accomplished authors have conferred a distinct benefit on those interested in that science which they have made peculiarly their own, by the publication of this little handbook.

Praktisches Lehrbuch der arabischen Umgangsprache syrischen Dialekts. Von R. SEIDEL. Wien, Pest, Leipzig: Hartleben's Verlag, N.D. Pp. 190.

We had recently occasion to review favourably the author's book *Praktisches Handbuch der arabischen Umgangsprache ägyptischen Dialekts*, and have now the pleasure of being able to commend his new work. It is well conceived, well balanced, and very free from errors. It meets a long-felt want. We should like however, to have had the Arabic character as well as the Roman used throughout the book. Certainly this would have added to both its size and cost, but would also have greatly increased its value. Visitors to Syria will do well to procure and study Mr. Seidel's book.

Ordnance Gazetteer of Scotland: A Survey of Scottish Topography, Statistical, Biographical, and Historical. Edited by FRANCIS H. GROOME. Vol. v. Maer—Rye. London, Edinburgh, and Glasgow: William Mackenzie, N.D. Pp. 292.

In former notices (vol. ix. p. 432; vol. x. pp. 163 and 555) we were able to give this fine work almost unqualified praise, and, as it is useless to repeat what has been already said, the present volume may be dismissed with the remark that letterpress and illustrations come up, in every way, to the former high standard. The colouring of the maps, however, continues to form the one blot on this otherwise excellently produced work, and this is the more to be regretted as tastefully tinted charts can now be so easily procured. But this is, comparatively, a small matter, as, otherwise, the book is as good as it well can be.

Oliver and Boyd's Edinburgh Almanac and National Repository for the year 1895. Edinburgh: Oliver and Boyd. Pp. 1173.

The new issue of this admirable handbook is as full of useful matter as usual. It has been brought down to date in the most thorough manner, and is, in every respect, a desirable and reliable desk and office companion. Digests of the legislation of the last parliamentary session bulk largely, and add to the utility of the volume. We do not quite follow the way in which the notices of the scientific societies have been arranged: for instance, the Royal Society of Edinburgh appears under the headings of "Scientific and Literary Institutions" and

"Public Offices and Institutions in Edinburgh," while many other societies, which can hardly be classed as "public," appear only under the latter. This, however, is a small matter, as the large and well-compiled index makes reference easy to any subject treated of. The volume is in every way equal to its forerunners, and no higher praise need be given it.

The Northern Counties Red-Book and "Chronicle" Almanack for 1895. Inverness: *Northern Chronicle* Office. Pp. 88. *Price* 3*d.*

We confess to feeling somewhat disappointed with the present issue. The lists for the counties, towns, and parishes frequently want uniformity, and, in some cases, hardly appear to have been brought down to date. Nevertheless, this is a most useful companion for any one residing in or having connection with the Northern Highlands. There is a mass of unpaged matter and advertisements.

Studies in Oriental Social Life, and Gleams from the East on the Sacred Page. By H. Clay Trumbull, D.D. London: Hodder and Stoughton, 1895. Pp. 438.

This is an English reprint, for popular use, of a work based on a series of lectures delivered before the Archæological Association of the University of Pennsylvania, and also before the Semitic Club of Yale University. Dr. Clay Trumbull applies his experience of work and travel in the East to the illustration of Bible truths and language. Reproductions of small photographs in "half-tone" light up this well-printed volume. It is in no sense, however, scientific.

"*The Flower of the Ocean*"—*The Island of Madeira.* By Surgeon-General C. A. Gordon, M.D. London: Baillière, Tindall and Cox, 1894. Pp. 110. *Price* 2*s.* 6*d.*

In this brochure Surgeon-General Gordon gives an interesting and descriptive account of Madeira and its climate.

As a medical man of repute, and a well-known authority on such subjects, Surgeon-General Gordon's opinions as to the suitability of Madeira as a health resort should be of value; and his book, if only on this account, will prove of more than usual interest to the invalid and others needing temporary residence in a milder climate than Great Britain affords.

The work is well written and exhaustive, and the chapters on the fauna and the plants of the island will be of interest to the naturalist and the botanist.

History of British Guiana. By James Rodway, F.L.S. Vol. III. Georgetown, Demerara: J. Thomson, 1894. Pp. 285.

In this, his third and concluding volume, Mr. Rodway narrates the history of British Guiana from 1833 to the present day. His concluding paragraph states that the colony is "now (1894) progressing slowly. A great deal will depend on the success of the gold-mining companies which have lately been established; if these fail, the results will no doubt be serious." Although a crisis seems approaching in the sugar trade, the colony need not despair, for "with its large extent of territory and many resources, there is no doubt plenty of room for developments in many directions—notably timber and forest products, not to mention gold." We wish Mr. Rodway had given us a map of British Guiana, revised and brought up to date by himself, for no colonial history is complete without a map. At the same time, the colonists and British Empire ought to be grateful to Mr. Rodway for his labour and erudition in the production of this excellent history.

NEW MAPS.

EUROPE.

HAWICK AND BORDERS. Bartholomew's Reduced Ordance Survey. Sheet 5. *Price, cloth, 2s. John Bartholomew and Co., Edinburgh Geographical Institute.*

In this new issue the contours are marked at intervals of 250 feet, and the area beyond the border is filled in.

ASIA.

NIEDERLÄNDISCH-INDIEN, Sohr-Berghaus Übersichtskarte von ——. Massstab, 1 : 13,000,000. Mit Specialkarte von Lombok, Bali und West-Sumbawa. Massstab, 1 : 1,500,000. Nach holländischen, französischen, englischen und deutschen Quellen bearbeitet von A. Herrich. *Price* 50 *Pf.*

Verlag von Carl Flemming, Glogau.

The most noticeable part of this map is the inset showing Bali, Lombok, and Sumbawa on a larger scale than is generally used for these islands. The larger map contains a great number of names.

TIBET and the surrounding Regions. Compiled from the latest Information. *Geographical Journal, July* 1894.

AFRICA.

AFRICA. Constructed and Engraved by W. and A. K. Johnston. Scale 1:8,200,000, or 130 miles to an inch. With Handbook.

W. and A. K. Johnston: Edinburgh and London.

The former edition of this *Handbook* was noticed in vol. vii. p. 512. The present map is brought down to date, the new boundaries according to the late treaties between Great Britain, France, Germany, and the Congo State being shown.

GERMAN EAST AFRICA. Karte der Nyasa-Expedition des Gouverneurs Obersten Freiherrn von Schele. Nach den Aufnahmen des Kompagnieführers H. Ramsay und mit Benutzung unveröffentlichter Aufnahmen von Lieut. Böhmer Lieut. Fromm, Kompagnieführer Herrmann, Kapitän Prager, Stationskontrolleur Schmidt II., Dr. F. Stuhlmann und Anderen, sowie des älteren Routenmaterials, konstruirt und gezeichnet von Dr. R. Kiepert unter Mithülfe von Prof. Dr. Freiherr von Danckelman, Dr. M. Limprecht, M. Moisel, und P. Sprigade. Massstab, 1 : 500,000. 1894. *Berlin: Dietrich Reimer.*

The exploration of German East Africa is progressing rapidly. While the map of the northern portions of the German possessions has recently been exhaustively reconstructed by Dr. Hassenstein from data carefully laid down by Dr. Baumann, another addition to geographical knowledge has now been made by Baron von Schele's recent journey to the northern shore of Lake Nyasa. All the routes of the explorers who have crossed this country have been used for the compilation of this map, and we possess, therefore, a fair knowledge, although much needs still to be done, of the territories between the Indian Ocean and the north of Lake Nyasa. Dr. R. Kiepert and those who assisted him in his laborious work have done a great service to African cartography.

ATLASES.

THE SATCHEL SCHOOL ATLAS. By J. G. Bartholomew, F.R.G.S. *Price 6d.* *John Walker and Co., London.*

A useful collection of forty maps, which, though small, show the broad facts of geography.

DEUTSCHER SCHULATLAS. Von R. Lüddecke. Mittelstufe. 1895. *Justus Perthes, Gotha.*

Sydow-Wagner's well-known systematic School Atlas has been adopted by Dr. Lüddecke for the basis of the present work. The former was prepared for the higher classes in German schools, while the latter is intended for middle-grade students. A third atlas, for beginners, is in course of preparation. The first page of the *Schulatlas* contains specimens of maps on different scales, and is followed by a series showing typical forms of land-surface. To Germany and its colonies a large number of sheets are naturally devoted ; the continents are delineated politically and physically ; and products, races, population, rainfall, ocean currents, etc., are cartographically represented. The execution is good, and, though designed from a German point of view, this atlas may be used with advantage by British teachers.

SEE-ATLAS, Justus Perthes' ——. Eine Ergänzung zu Justus Perthes' Taschen-Atlas, entworfen und bearbeitet von Hermann Habenicht. Mit nautischen Notizen und Tabellen von Erwin Knipping. 1894. *Justus Perthes, Gotha.*

This small nautical atlas is intended as a supplement to H. Habenicht's well-known and widely used *Pocket Atlas.* It is really astonishing to see the great amount of information given on these little maps without interfering in the least with the clearness. On the ocean maps are indicated the winds and rainfall at different seasons, cyclones, currents, steamer routes, limits of drift-ice, notes on sea-fisheries, and magnetic declinations ; and special maps of particular seas contain notes on tides, coasts, dunes, lifeboat and coaling stations. The small plans of harbours are a special feature of this atlas. The introductory notes and tables by Erwin Knipping are written from a practical point of view for use on board ship both by sailors and passengers. The atlas is, like all Perthes' publications, a splendid specimen of cartography.

SCHWEIZ, Topographischer Atlas der ——, im Massstab der Original-Aufnahmen nach dem Bundgesetze von 18 Dezember 1868 durch das eidg. Topogr. Büreau gemäss den Direktionen von Oberst Siegfried veröffentlicht. Lief. xliv.

No. 262. Hinter Wäggithal.
„ 283. Sainte-Croix.
„ 289. Bel Coster.
„ 297bis. Les Mines.
„ 298. Le Brassus.
„ 299. Le Sentier.
No. 381. Brunnen.
„ 431. Marchairuz.
„ 538. Taverne.
„ 544. Porto Ceresio.
„ 546. Varese.
„ 548. Val della Grotta.

Presented by Professor Paul Chaix.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ANDORRA: THE REPUBLIC OF THE PYRENEES.

By John Smith.

(*Read at Meetings of the Society in Edinburgh and the Branches, January* 1895.)

Louis Philippe of France is reported to have exclaimed on one occasion with reference to the Republic of Andorra, "What! is it possible I have a neighbour whose name I have never heard before?" And Lord Rosebery, in his speech at Glasgow last November, when discussing the question of Second Chambers, instanced Andorra as one of those single-chamber States on which the advocates of a single Chamber meant to rest their case, and then went on to say: "You may not have heard of Andorra; it is a valley in the Pyrenees, and I should say that its single Chamber is about the equivalent of one of the new Parish Councils."

Those were Lord Rosebery's words to a political audience; and, although not presuming to infer that this audience, like Louis Philippe and Lord Rosebery's hearers, may not have heard of Andorra, yet, as it undoubtedly is a republic which has escaped, to a great extent, the attention of the geographer and the tourist, I shall try to-night to throw a little more light upon this *terra incognita*.

Though, as I have said, it is a State little known to the general public, there is a fair amount of literature relative to it, principally written by Frenchmen—among others, by M. Roussillon, M. le Docteur Léon Clos, and M. Bladé. The latter gentleman made a special study of the land and its people; and, after several years of labour, published his *Histoire et Institutions de la Vallée d'Andorre*. Some pamphlets and books have also been published by Englishmen—the Hon. Mr. Murray, and a lady, Miss Mary Eyre, for instance; and Mr. Eagle Clarke, of Edinburgh, has written a very interesting pamphlet on its ornithology.

The American, Mr. Bayard Taylor, has also made a contribution to the knowledge of this interesting land.

I may here remark that, according to Miss Eyre, who visited the land in 1865, the Hon. Mr. Murray was, in 1845, the first Englishman to visit its fastnesses, while she claims to have been the first Englishwoman within its borders. When my wife and I visited it last summer, my wife, according to our Andorran guide, was only the fifth Englishwoman who had been there. So, you see, Louis Philippe and Lord Rosebery had some excuse for their remarks.

The route we chose to the Andorran capital, which is also called Andorra, was by taking train from Paris, *viâ* Toulouse, to Ax-les-Thermes, the terminus of the railway in South France. This town is twelve miles from the Andorran frontier, and is one of the numerous Pyrenean spas. A small mail-coach travels between Ax and Bourg-Madame, a town near the Spanish frontier, passing on its way the hamlet of L'Hospitalet, which is the starting-place "for the mountains," as the natives say, referring to Andorra. This clachan is one of the most squalid places imaginable. A small flock of sheep took up all the available space in its square—to give it a grandiloquent appellation—and one had to exercise great care to avoid the heaps of dirt and rubbish strewn along the sides of the narrow streets or lanes. There, at L'Hospitalet, we hired horses, for there are no coach-roads in the Republic, only mule-paths. As the journey of twenty-five miles takes practically an entire day, we arranged to start at half-past four in the morning. Fortunately, the guide and horses were not more than an hour and a half late in turning up. Such dilatoriness is, we learned, customary in those parts. We were provided with two rather fine animals, and mine was furnished with a good military saddle; but, as ladies are rare visitors in Andorra, there was nothing in the shape of a side-saddle for my wife. What was provided was a sort of pack-saddle, about three feet wide, made of straw, covered with a sheep-skin and a rug. There was no stirrup, so a piece of wood about a foot and a half long was tied up with strings at either end to make a support for the feet.

A mile from L'Hospitalet we crossed the Andorran frontier, and traversed for about three miles the treeless upper valley of the Ariège, a tributary of the Garonne. We gradually ascended the grassy mountain-side by the mule-path, which in certain places was very stony, requiring care on the horse and rider's part. On the way we passed shepherds' huts, and large herds of horses, mules, and cattle grazing on those fertile pasture lands.

Towards the end of the valley we ascended by an abrupt zig-zag path marked by cairns, which are indispensable when the track is covered by snow, to the mountain pass of Saldeu, 8000 feet above sea-level. Although it was nearly the middle of June, snow lay knee-deep on the summit. It was strange to find not far off our own spring flowers, the cowslip, anemone, and white and yellow crocus, just coming into bloom.

At this height a grand panorama was spread out before us in the early morning light; the snow-clad mountains encircling us were bathed in brilliant sunshine, while the pastoral valley of the Ariège lay on the

one side, and the agricultural valley of the Valira del Orien on the other. Looking back, we saw the source of the Ariège, the waters of which flow in a north-westerly direction, and ultimately find their way into the Bay of Biscay, while on the other side we saw the rise of the Valira del Orien, a tributary of the Rio Segre, itself in turn a tributary of the Rio Ebro, which, running at first southwards, ultimately flows into the Mediterranean Sea.

After a gradual zig-zag descent from this *col* we entered the first Andorran village, called Saldeu, a place with about one hundred inhabitants. Here we breakfasted and rested our horses, for it can boast of an hotel. This was our first experience of Andorran hotels. The dining-room was a long, low room, with two doors, one of which opened on to a verandah and did duty as a window. We sat down to a curious meal. Special food was put before us: farther down the table something else was set for the guide; and still farther down some muleteers breakfasted off Spanish dishes. At the bottom of the table some coarse plates were set, evidently for the proprietor's family, but they did not sit down at the same time. We were rather amused at the wholesale way in which our guide and the muleteers ate the trout. First, they pulled off the head and sucked it before swallowing it. They then ate the rest of the fish—bones, tail, and all.

The hotel was small, but not the bill; the latter was according to the usual tariff of our own Highland hotels in the season. After leaving Saldeu we continued our trudge along the narrow, stony, and still descending path, and crossed a well-made bridge, spanning a small stream that flows down a valley from the Port de Fontargente, another pass leading from France into Andorra. The peasants' dress in these parts told us plainly that France had been left behind. The Frenchman's blue blouse and large straw hat had given place to the Spanish brown velvet suit and red cap.

The next important village we passed was Canillo, with about 600 inhabitants. Without halting here, we passed over a newly-constructed wooden bridge and began to ascend again. In fact, the whole route from L'Hospitalet to Andorra might be described as one long switchback—here a toilsome ascent and there a slippery descent. As showing—shall I say?—the uncivilised state of the natives, I may mention that about this spot, while I was removing my kodak from its leather case and focussing it, a woman, who abruptly came upon us at a bend in the path, evidently taking my kodak for a kind of Maxim gun, or something of that sort, threw up her arms in alarm and shouted at the pitch of her voice for help from the village below.

Shortly afterwards we passed through a wild, narrow and precipitous defile, through which the Valira del Orien rushed with deafening roar in the depths below. We then came to another village, Encamp, about the same size as Canillo. All these villages had a very deserted look; the majority of the men, at any rate, being up in the mountains tending their herds, or looking after their fields, or, more probably, engaged in contraband traffic. The houses of the Republic are usually of two flats; the lower flat used as stable, byre and hen-house, the upper as the

dwelling-house. They have a sombre appearance, being built of dark granite and whinstone, with rusty slated roofs. The oak doors, oak window-frames, and oak balconies, where these exist, are never relieved by paint. Many of the houses have no glass in some of their windows—a custom borrowed from Spain. Proceeding on our way, we remarked that the nearer we approached the capital the valleys became apparently more fertile, and agricultural rather than pastoral, and that more attention had been paid to the bridle-paths. In the more distant parts we sometimes found the path entirely swept away by a mountain torrent, or sometimes part of it had fallen off into the depths below. We next passed through Las Escaldas, where we observed women washing clothes at hot mineral wells. Here, also, we noticed the first bee-hives we had seen in the country. They were uncommon in construction, being made out of stumps of trees, about four feet high, and roofed with large slates. When crossing a bridge here, we saw a snake about a yard long, wriggling along the ground. It seems that there are a good many of them about the country, but they are perfectly harmless. Near this village we passed, riding on his horse and dressed in a velvet jacket, one of the three doctors who look after the bodily welfare of the community.

From this village you have a most striking prospect. You are at the upper end of a rich smiling valley, enclosed by noble mountains, well wooded in some parts, wild and precipitous and snow-capped in others, and the first view of the small capital, perched upon a rocky ledge running out from the western side of the valley, bursts upon you. I found I was not the only one who had been arrested by the beauty of this landscape. Bayard Taylor had also been charmed with its beauty, and he thus describes the enchanting scene. "What a picture! I stood in the deep shadow of the mountains in the heart of a wilderness of rocks, which towered out of evergreen verdure, and seemed to vibrate amidst the rush, the foam, and the thunder of streams. The houses of the village, clinging to, and climbing the sides of the opening pass, made a dark frame through which the green and gold of the splendid valley, drowned in sunshine, became, by the force of contrast, limpid and luminous as a picture of the air. The rocks and houses of Old Andorra, and the tower of the house of government made the central point of the view; dazzling meadows below, and mountain terraces above, basked in the faint prismatic lustre of the morning air. High up in the rear of the crowning cliffs I caught glimpses of Alpine pastures; and on the right, far away, streaks of snow. It was a vision never to be forgotten; it was one of the few perfect landscapes of the world."

An American artist whom we met in the country also told us that he did not remember a finer picture in all his wanderings than this, more particularly when seen in evening light.

Half an hour after leaving Las Escaldas our small cavalcade entered the narrow, tortuous, ill-paved streets, or rather lanes, of Andorra-la-Vella—Old Andorra as it is called.

We entered its one *hostal*. This contained a long, narrow, low-roofed, dirtily-kept dining-room, or, more correctly speaking, public bar.

Then, after passing through its still more dirtily-kept kitchen, we ascended a rickety wooden stair to the bedroom flat, where were four or five rooms, into one of which we were shown. Its bare floor, with the dust of ages accumulated under the bed, did not look particularly inviting. To clean a room, or make a bed, before somebody arrives to occupy it, is considered lost labour, seeing so few strangers visit the place.

A passable dinner was placed before us the first night. Eggs, it appears, are favourite food with the Andorrans, and enter very largely into the composition of their dishes; oil is another very important article in their cuisine. No butter, and little milk, is obtainable in the town during summer.

The town of Andorra contains about 700 inhabitants, and stands 3200 feet above sea-level. Its chapel is said to date from the tenth century, but there is nothing about it calling for special notice. A short time prior to our visit, the religious feeling of the community had been greatly excited regarding an order of the Spanish Bishop of Urgel, who is the ecclesiastical superior. He had affixed notices on the chapel doors throughout the country, that, unless the customary tithes were paid to him, the defaulters would be excommunicated. Those placards had all been ruthlessly torn down, and their purport utterly ignored up to the time of our visit.

The building which calls for special notice in the village is the Palace, or the Andorran Parliament-house. It dates from the sixteenth century. The exterior is of a plain style of architecture. One of the angles is surmounted by a tower. Above the door are carved on white marble the arms of Andorra, with the following inscription in gold letters: "Domus consilii, sedes justitiæ." A stair leads up to the council-chamber, which is a large and lofty, but simply furnished, hall, surrounded with oak seats, and with a picture of Christ at one end. From this chamber you enter a smaller hall, where the archives of Andorra are kept in a strong oaken chest. This chest has six keys, one of which is kept by each parish, and therefore, unless all the six parish representatives are present, the chest cannot be opened. To the left of this latter hall is a small chapel, and close by the chapel is the quaint-looking kitchen, with a great fireplace and chimney in the centre. Alongside the kitchen is the dormitory where the members, whose houses are too distant for daily travelling, put up during the session.

The Spanish frontier is six or seven miles distant, and the route to the south is similar to that already described. Between Andorra and the frontier is San Julia, a village of 600 inhabitants.

Having given a short *résumé* of our route through the Republic, I shall now make some remarks upon the country generally, and upon its primitive people.

The name Andorra is said to have been derived from the Arabic *Aldarra*—a place thick with trees—but the ancient forests have been greatly depleted by the natives to furnish fuel and building material.

Andorra is situated in the very heart of the Eastern Pyrenees, and its capital is about seventy-seven miles due south of Toulouse. Its

greatest length, from north to south, is seventeen and a half miles, and its greatest breadth, from east to west, is twenty miles. Its area is about 250 square miles, and its population, according to an estimate made after a very careful collection of information in the country by a French savant a few years ago, is about 6500. The land is divided into six parishes—Andorra, San Julia, Encamp, Ordino, Canillo, and Massana. It is *par excellence* a "land of mountain and of flood." Its lowest land, near San Julia, in the south-west of the Republic, is almost 3000 feet above sea-level. It contains three principal valleys, called respectively—del Orien, which runs from east to west at its upper end, and afterwards turns to the south-west; the Ordino, running north and south; and the Embalira, also running north and south. All of these valleys are copiously watered by streams of the same names, which, uniting within the limits of the Republic, flow into the Rio Segre on the Spanish frontier. The rest of the land is practically composed of mountains, some of them, such as Pedrosa, Grio, and Estanyo, attaining an altitude of 9500 to 10,000 feet. There is not much arable land, but what there is the inhabitants take full advantage of; they even build up retaining walls on the mountain sides to form terraces for cultivation. In the valleys rye and barley are extensively grown; and we noticed plots of potatoes, cabbages, and other kitchen vegetables, as well as vines—which do not, however, attain to much perfection—and the tobacco plant. The pasturage of the country is extensive; the mountain-sides are in some parts well covered with forests and woods of pine, oak, and willow, but in the northern part of the country the higher tops are quite bare.

The natives, as adapted to their environments, are of a hardy, vigorous, and independent nature. They are of the build of the Scottish Highlanders, and are all Roman Catholic. They have free education; but the schools are few in number, and the people are not well educated as a whole. A number of the eldest sons of the wealthier families, who will ultimately be the feudal proprietors, are sent to schools either in Barcelona or Toulouse. The law of primogeniture prevails in the Republic. Although the Andorrans are, no doubt, of Iberian descent, they have a more open and independent expression of countenance than their southern neighbours. As characteristic of them, it may be mentioned that a few years ago the French Government, without consulting them, constructed a telegraph line from France to the town of Andorra, when, to show their independence, the Andorrans pulled down the poles and cut the wires. Since then, however, they have permitted the line to be reconstructed. Another trait of their character is their reserve. When a question is put to them, regarding which they think that "silence is golden," they put on a stupid expression, and pretend not to understand. For instance: a man came to a traveller sojourning in the country, and, showing him a rich specimen of galena, said: "Do you know what this is?" "Certainly," said the tourist, "it is the ore of lead; where did you get it?" but the man put it back in his pocket, looked up at the sky, and said: "What fine weather we are having!" The Catalonians have observed this trait of the Andorrans, and when one of them assumes ignorance they say "he plays the Andorran." It

is related of a student from the frontier that being required, on entering a Spanish theological seminary, to translate a portion of the New Testament, he rendered the words, "Jesus autem tacebat," in perfect good faith, "Jesus played the Andorran."

The people, excepting a very few families, are all poor. The country is rich in iron and lead, it is true, but they are very little worked. The Andorrans say that they do not want to become wealthy, lest France or Spain should desire to annex their land. Their wealth principally consists in their herds of cattle, horses, mules, sheep, goats, and pigs. Transport in Andorra, as well as in the surrounding provinces, being carried on by mules and horses only, makes the breeding of these animals a very important industry, and as much as £40 is paid for a good mule or horse. The timber of the forests is also a source of wealth, and no scruples are felt about the very extensive trade done in contraband goods, principally tobacco, with France and Spain. The natives smoke the tobacco grown in their land without any further preparation than drying it in the open air.

Their language is a dialect of the Catalan; only six people in the capital can speak French.

As I before remarked, the country is rich in minerals, but the cost of transport would be too great for an export business to be profitably carried on. In the Ariège Valley, half a mile from Andorran territory, but on French soil, an ironstone mine was worked until seven years ago. Its produce was excellent, I understand; and its exhibit received the second prize at one of the Paris Exhibitions, the first prize being gained by an English firm; but the transport was so costly, and the working season so curtailed by the winter snows, which blocked the roads, that the mines had to be abandoned.

Notwithstanding the transport difficulty, when we were in the Republic, an American was treating with the Mayor of Andorra for the lease of certain mineral lands. In reply to fears I expressed regarding the transport difficulty, he said that that would be overcome by the American system of haulage; but I do not think the negotiations would be crowned with success.

In addition to these minerals, there is abundance of marble, slate, and granite. There are also numerous hot and cold mineral wells of sulphur, iron, lime, etc.

As to the botany of the country, it possesses, of course, a wide range. Among Andorra's lofty heights and genial valleys are observed pines, firs, oaks, poplars and beeches; the rose, anemone, narcissus, clematis, wild fig, ivy, crocus, and cowslip; the vine, and the scented boxwood, which grows in profusion and to a great height. The nightingale, linnet, goldfinch, and other birds enliven the landscape and charm the ear.

Andorra is not a land that has much attraction for the sportsman, either with the gun or the rod. There are trout in its streams and game on its mountains, but it has no prospect of competing with Norway's streams, or Central Africa's forests, in the eyes of the British sportsman.

Let us now glance for a little at the history and the government of the Republic.

The historian finds the early history of Andorra, like the early history of most nations, very much obscured; still, there seems to be a consensus of opinion that its origin as a separate State was the indirect result of the struggle between the Saracens and the Franks. About the year 805, Louis le Débonnaire, the son of Charlemagne, decided to besiege Urgel, a town in north-eastern Spain. In this enterprise he obtained the assistance of the inhabitants of the Andorran valleys, headed by their brave clansman, Marc Almugaver. After the Saracens were defeated and expelled from that part of the peninsula, Louis permitted the natives of these valleys to govern themselves according to their own laws. Such seems to have been the origin of the Republic. As is well known, however, there were many small self-constituted independencies in the Pyrenees and various parts of Europe during the Middle Ages. Ultimately, on Louis's accession to the throne, he ceded to the Bishop of Urgel the half of the tithes of the six parishes, and organised a body for administrative purposes, which still exists in practically the same forms and with the same names.

From the researches of M. Bladé in the archives of Andorra, Urgel, etc., it seems that in course of time the sovereign rights, which Louis had retained for himself, were given to the house of Castelbo, and through it passed to the Counts of Foix, in France. After long quarrelling between the spiritual and the temporal powers, between the Bishop of Urgel and the Count Roger Bernard of Foix, a decree, called the *Pariatges*, the Act of Division, decided in 1278 the question of the sovereignty of Andorra. That arbitration awarded a conjoint sovereignty to the Bishops of Urgel and the Counts of Foix. The house of Foix later on became merged into that of Béarn, and in course of time the rights of Béarn fell into the hands of the Bourbons. These divided rights of sovereignty in Andorra were the greatest guarantee and safeguard of its independence. Its people in the past recognised this fact. When the French Convention in 1793 refused to accept their annual tribute, as being, in its opinion, a relic of the feudal system, they were filled with dismay; but, upon the establishment of the Empire a few years later, the tribute was again accepted, much to the delight of the Andorrans. To-day, the Andorrans pay to France a tribute of 960 frs. (about £38), and about half that sum to the Bishop of Urgel.

Towards the end of 1880 Andorra was troubled by a certain section of its own wealthier class, which, in conjunction with a French syndicate, decided to build a casino at Escaldas, after the model of Monte Carlo. They obtained the permission of the Bishop of Urgel, but unfortunately had not received, nor asked, the permission of France for the erection of this gambling house; so, to compel the Andorrans to respect the co-sovereignty of France, a battalion of French soldiers was sent to the frontier. This threat brought back their better judgment, and so the idea of Andorra becoming another Monte Carlo came to an end.

This, then, is an outline of the history of Andorra. "No one can help feeling," says a writer, "that a wholly exceptional fortune has fol-

lowed this handful of people. All other rights given by Charlemagne and his successors became waste-paper long ago. The houses of Foix and Béarn have disappeared, and the Bourbons have ceased to reign in France; yet the Government of the little Republic preserves the same forms which were established in the ninth century, and the only relations which at present connect it with the outer world date from the year 1278."

We shall now refer to the Government of the Republic, improperly so called; for, I think, the remarks I have just made upon its history will show that, strictly speaking, it cannot be called a Republic. In fact, in all its own official documents, it entitles itself "Vallées et Souveraineté d'Andorre."

It is governed by a Grand Council composed of two consuls and two councillors, elected by the heads of families in each of the six parishes. No man can be elected consul who is under thirty years of age, who has not been married, or who is addicted to drink. These twenty-four representatives elect the Syndic or President, who is chosen for life, and two Vice-Presidents. The French Government, as representing the rights of the Counts of Foix, appoint a *Viguier* (vicarius), usually some official of the Department of Ariège, while the Bishop of Urgel also appoints a *Viguier*.

Upon condition of respecting the rights and the laws, written and unwritten, of the valleys, the two *Viguiers* exercise together all the powers with which they are invested by custom and by ancient title. If one of them be absent, the other can act alone. They are the heads of the army, which is composed of all the men of the valleys without regard to age. Each head of a family is compelled to have in his house both arms and ammunition, and to be ready for service whenever called upon. The consuls appoint certain magistrates, whose duties are very similar to those of our police. All tradesmen and persons possessing property form what is called the Parish Council, whose chief business is to collect the tribute, apportion the pasture, to decide upon the amount of forest timber to be sold, and other ordinary local matters. You will perceive from this that the Andorrans have long ago passed a kind of Local Government Bill.

Andorra has effected a compromise in respect to the question of the payment of members. The members of its Grand Council or Parliament are not paid, but they are lodged and fed during their sittings at the public expense; this possibly explains the fact of there being five sittings or sessions every year. Each parish owns two double beds in the Parliament House, where its two consuls and two councillors rest their weary heads when their parliamentary duties are over for the day. It will be apparent, therefore, that the expenses of the State altogether are very small. It is also blessed in having no foreign debt. The revenue is derived from the sale of wood and charcoal and the rents of the Government pasture-lands.

It is also quite in the fashion in having an income-tax, amounting to about two per cent. on the income. The law is administered by two representatives called *Bailles*. Their principal duty is to hear and decide,

in the first instance, all civil and criminal cases. When a case comes before them, the *Bailles* first endeavour to reconcile the parties. If that fails, the case is formally considered and judgment pronounced. The more important cases, and appeals from the decision of the *Bailles*, are taken before the two *Viguiers*. It is very seldom, however, that any serious lawsuit occurs, or that any capital crime is committed, for, as a whole, the Andorrans are a moral people.

There is daily postal communication with the outside world. A letter-carrier leaves the capital every morning on foot at three o'clock for the village of Saldeu, while another also arrives at Saldeu from the French border with the incoming mails: there they exchange bags and return in the afternoon. French stamps are now used in the Republic; the State formerly had stamps of its own, but they were discarded a good many years ago.

Now, in drawing my remarks to a close, I would say that we greatly enjoyed our sojourn in these beautiful valleys and amongst this quaint and interesting people. However, the intending traveller must be prepared to rough it. Hotel accommodation is very inferior, and the cooking is far from appetising. Living is cheap, in spite of what I said regarding one hotel. Furthermore, the traveller's nerves should be in good condition, for the bridle-path is rather trying—in many parts running alongside of steep precipices, 200 to 300 feet deep, and in others leading over burns and mountain torrents. The horses have a very bad habit of keeping well to the outside edge of the narrow path; though I give them credit for being exceedingly surefooted. Reared on the mountain pastures, they have probably learned from bitter experience in their early days the sad results of not looking to their feet. The country has a fine, healthy, invigorating climate; and, I am sure, with all its drawbacks, those who venture to explore its secluded vales will come back richly rewarded, and sounding the praises of its beauties, the attractive primitiveness of its people, and the health-giving properties of its atmosphere.

AN EAST AFRICAN WATERWAY.

By Commander Henry J. Keane, R.N., C.M.G., F.R.G.S., F.I. Inst., of H.M.S. *Edinburgh*, South Queensferry.

(*Read at a Meeting of the Society at Edinburgh, Feb.* 1895.)

African affairs, whether geographical, political, financial, or missionary, should be sure of an interested and highly critical audience anywhere in Scotland, for Scotsmen first brought to notice the vast resources of the country, pointing out the crying necessity for mission work and civilisation, and then Scottish enterprise and determination initiated and persisted in those early efforts, which, in spite of much danger and difficulty, have succeeded in transforming the land entirely. And that, too, in a very short period.

In Scotland's capital there is no need to make mention of any names; nor in the centuries to come will those founders of empire ever be forgotten, for their names are indelibly printed upon the physical features of the country, and they can only be more and more respected and admired as that vast continent advances in importance and power.

Surely no one who has watched the course that events have taken during the last few years, can have any doubt as to its power and importance in the near future. Nor, probably, has any country risen from obscurity and neglect into universal notoriety in so short a time; and, certainly, no country has ever been so keenly sought after by the nations upon earth, so carefully portioned out, so jealously wrangled over, or so lavishly exploited.

The method of exploitation is peculiar to the times, and thoroughly typical of them; for neither conquest nor diplomacy, the old-time methods, is very conspicuous; but finance, daring and capable, dominates everything and carries all before it. In fact, the great exponent of this modern method of acquiring territory has expressed his intention of applying it in a certain quarter, where, should he succeed (and he probably will), he will solve a difficulty that has baffled British diplomates and generals of the greatest celebrity, and which is still a cause of grave suspense to more than one European power.

So successful has this method become, such important geographical alterations has it effected, and so much is it in accordance with the spirit of the age, that it becomes necessary to add yet another branch to geographical science; and perhaps the best name for it will be financial geography.

The schoolboy of the future, besides learning that each country has certain races, mountains, rivers, lakes, cities and other physical features that distinguish it, will also be taught that this country is being exploited by a chartered company, with a capital of so many millions sterling, the shares of which are at so much premium, and the dividends at so much per cent.; that another country is being financed by a limited liability company; another entirely controlled by a wealthy syndicate; whilst a few, perhaps, may be absolutely and despotically ruled, each by a rich financier. And if the schoolboy of the future inherits and accentuates the bias of his forebears, it is probable that financial geography will interest him more than any other branch of the science. This will necessitate additions to the methods of government as recognised in the past, unless we lump together all these countries of the new method under a republic of riches; but where Socialism and the other "isms" are to come in under such a system of government it is difficult to understand.

However, such far-reaching speculations are opened up by these considerations, that we dare not attempt to trace any of them in this paper; but we will at least hope that the government by the republic of riches may not become a golden despotism. One thing, however, is certain, namely, that money has obtained control of countries in East Africa which could not be obtained by other means, and surely it is reasonable that the result of the financier's successful efforts should be recorded

geographically, in a manner similar to those of the able diplomate and the conquering general.

Maps that only treat of the political or governmental divisions of the country show but little of the real working power, energy, and resources of those countries where the financier has stepped in and undertaken the management of affairs upon business principles.

Without in any way casting doubts upon the efficiency of the ordinary governmental methods, there may be said to be much to recommend this apparently popular system of exploitation by private enterprise; and as geographers, at least, we ought to be thankful for the amount of work done in exploration and research that has caused no expense whatever to the government of the nation. In the early days of a country, at any rate, it seems likely that a knowledge of its resources will be more quickly gained, and the knowledge turned to better account, by the well-directed efforts of groups of wealthy men of business, than by the more ponderous procedure of imperial governments. This is only natural, for the government is the guardian of the nation's purse and must needs be most careful; but the merchant may venture a good deal to open up new markets for his wares, without incurring a charge of culpable recklessness.

At this time, too, there need be little fear of anything like a "South Sea Bubble:" for though there is a spirit of enterprise very manifest amongst us, there is also a considerable amount of caution, the outcome of dearly bought experience, to balance it.

Leaving the future possibilities of this fascinating country, for the time being, let us regard broadly the physical conditions that form its chief characteristics; let us see what Nature has done for it: and I think it will be acknowledged that Nature has bountifully bestowed good things upon this region. Tropical Africa has been described as consisting of three belts or zones: the coast belt, low and for the most part malarious, unhealthy and unprofitable; the intermediate belt, composed chiefly of rising land but varying somewhat in width according to the angle of its rise; and then the great central plateau.

This is a good general description; but were it absolutely true, were this central plateau a vast flat area, it is manifest that it would be at a great disadvantage as regards facility of transport. But nature has diversified the features of the land, and varied its monotony by rivers and lakes, which are invaluable as means of easy and rapid communication. Moreover, they have been distributed in such a manner that they are of the greatest use to the greatest area. There is a hollow which runs meridionally through the heart of the African continent, that, with the exception of the Murchison Rapids, and two other interruptions of at most 200 miles each, affords a waterway from the Indian Ocean to the Mediterranean.

At the southern end of this rift lies Lake Nyassa (about 1700 ft. above sea-level), a stretch of water 360 miles in length, navigable for ships of the deepest draught. Between Lakes Nyassa and Tanganyika is the first interruption; this is the plateau across which was engineered the well-known Stevenson Road, which must be about 200 miles in

length. This distance between Lakes Nyassa and Tanganyika appears to be somewhat doubtful. My late friend, Captain V. L. Cameron, R.N., was strongly of the opinion that the south end of Tanganyika is placed too far to the westward on the maps. Moreover, from the time taken by travellers and natives to cover the distance—and it is a much frequented road—it certainly does not seem to be as long as it is said to be.

Lake Tanganyika then takes up the same trough-like form that characterises this central continental depression, and extends over 400 miles more to the northward, where another and very similar interruption is met with.

Crossing this second plateau, a distance of about 180 miles, the Nile system is reached, and thence the Nile valley carries the rift as a waterway to the Mediterranean without further interruption of a physical nature.

The wonderful boon that such a line of easy communication, through the very heart of the continent, must necessarily become, is apparent to any one who will look at the map of any civilised country and observe how most of the principal cities and large inland towns are clustered upon the rivers and lakes. And the reason of this will be obvious to our schoolboy of the future, who will have learned that water-carriage is the cheapest method of transport, and will have realised that the reason it is so, is because nature keeps up the permanent way, free of cost. It would appear that the financier is fully aware of this boon, for the companies are clinging closely to the lands in the vicinity of this great natural trade-route, and the headquarters of these companies are probably the sites of the cities of the future.

Of this route my own personal knowledge extends only from the sea to Lake Nyassa; but my interest is with it from end to end, and my desire is to traverse it from the Indian Ocean to the Mediterranean.

Lake Nyassa, lying at the southern end of the "trough," empties itself by the Shire river into the Zambesi, and thence into the Indian Ocean, so that these two rivers may be regarded as the southern portals of the inland waterways, and, as such, their value and importance become greatly enhanced, for the chain of lakes would not be of so much value were it not for the rivers that run into the sea from either end of the trough. Even at this early stage of the development of the country, the great benefit of an easy means of transport is already felt, and it is tacitly acknowledged that the Chinde is the gateway into the interior, even to the countries of the upper waters of the Congo. What this means to the would-be colonist, explorer, trader, or pleasure-seeker, is readily understood, if we remember the terrible conditions under which the earlier travellers in that country prosecuted their explorations; and to illustrate these, I quote from Owen's *Voyages* some descriptions of the endeavours of three of his officers to explore the countries of the Zambesi region.

The Sena Expedition,[1] consisting of Lieutenant Browne, Mr. Forbes,

[1] *A Narrative of Voyages to explore the Shores of Africa and Arabia and Madagascar.* By Capt. W. F. Owen, R.N., vol. ii. p. 115.

Mr. Kilpatrick (assistant surgeon), and two black servants, left Kiliman on July 23rd 1824, in large canoes supplied by the Governor of Kiliman. They must have made slow progress up the Kiliman river, for they did not reach Boca dos Rios until the 28th. It is at this place, called Momboosh by the natives, forty-seven miles by river from Kiliman, and thirty-two as the crow flies, that the Kwa-Kwa enters the Kiliman. On August 2nd, the travellers reached the Zambesi at Maruro. They give descriptions of the surrounding country, but such is the changeable character of the river, especially in this region, that these notices can be of little value at the present day.[1]

The explorers speak of the Luabo as branching off from the Zambesi at Maruro, whereas it now branches off thirty miles farther down the river. They further remark with regard to the delta of the Zambesi, that several streams branch off from the Luabo, one of which bisects the country between that river and the Kiliman, entering the sea at Melamby, and record in a footnote that a large brig, the *Sincapore*, entered this river, mistaking it for the Kiliman, and found it spacious, clean, and of greater depth.

At Shupanga the party was hospitably entertained by Donna Pascoa d'Almeida, who is described as the governor of the district. From the south-western boundary of her territory were brought the trees out of which were hewn the enormous canoes that plied along the rivers, and it is from the same place that they come to-day. Donna Pascoa informed Lieutenant Browne that her wealth would be much increased if she were allowed to work two gold mines that had been discovered in her territory. A specimen of this gold, about one-third of an ounce in weight, was afterwards presented to Lord Melville by Captain Owen, R.N.

During their stay at Shupanga Browne examined a lake to the south of that place, and found it to be about three miles in circumference; here also Forbes experienced his first attack of fever, from which he died on the 16th during the journey to Sena. The priests extorted 127 Spanish dollars as fees for the funeral ceremony, governor and travellers being apparently powerless in the hands of these rapacious rascals.

At Sena a manuscript memoir by Senhor Terão, governor of the Rios de Sena district, appears to have been seen by the travellers. "Sena," he says, "is the capital of the Captaincy of the Rios de Sena district, the only territory the Portuguese really possess on the east coast of Africa. On the east the district is bounded by the sea, on the south by the mountains of Sofala. The northern portion contains the district of Kiliman, with all the Kaffirs of North Bororo, to the vicinity of Morambala, where the Zambesi divides into two branches (one of which is now known to be the Shiré River), and thence to the hills of Lupata, the river serving as a boundary to the colony, all the northern side being in the possession of the independent kings of the Moraves."

[1] In quite recent years the African Lakes Company had a station at Mazaro, close to Maruro; when we surveyed the river in 1891, the main channel was found to pass over the site of the former station.

As Englishmen are often accused of unjustly reporting the methods adopted by the Portuguese in Africa, it is perhaps well to hear the report of one of their own governors. He affirms that the Dominican friars "are violent and oppressive; they oppose matrimony for the sole purpose of extorting money by violent and indecent means. Hence ensue debauchery and immorality." "Rich metallic products and fertile soil," he goes on to say, "have made the country valuable, but neglect and indolence have rendered Nature's gifts almost valueless. Navigable rivers, extending in every direction and communicating with the sea, afford an easy channel for export traffic, but the same cause still prevails, and the Zambesi, with its seven mouths and numerous branches, navigable for 300 leagues, flows on, bearing on its bosom nothing but a few canoes."

Yet Senhor Terão describes the agriculture of the country in 1806 as in a flourishing condition. The natives cultivated more wheat than they could consume, and coffee and rice, being better tilled, yielded still larger returns. Sugar was made, vegetables were grown in considerable quantities, indigo was found in a wild state, and cotton was cultivated by the natives for their own use. There was a considerable trade in ivory, hippopotamus teeth, horns, tiger skins, honey, and wax; gold dust was brought from Crown lands at Quiteve, Manica, Masizuros, Abutica, Zambo, Mesconga, and Mano, and iron was abundant in the Sena district, where it was made by the Moraves into hoes.

The different districts in the colony were governed by Portuguese, who paid annually a small tax, and received a revenue from the free Negroes.

In contemplating these reports of a governor of a colony, we must bear in mind that they were made in the dark days, perhaps the darkest days of the Dark Continent, that much light has been shed upon the land during recent years, and that even our own European civilisation has wonderfully improved during the past century.

Reverting to the narrative of the unfortunate explorers, we find that the good Donna Pascoa arrived in Sena shortly after them. There was a good deal of sickness prevalent in Sena, so on 1st September the party obtained permission to push on to Tete, and preparation was made for the journey, but Lieutenant Browne fell ill and died on the 5th September. The priests refused to bury him, and as Kilpatrick was too ill to do so, the duty was performed by a faithful black servant.

Kilpatrick, now the sole survivor, lost heart entirely. The servants took him in a canoe to Shupanga. Donna Pascoa was stricken with grief at Lieutenant Browne's death, and urged Kilpatrick to adopt the native treatment for the fever, but he declined, being unnerved and broken-hearted. He drank liquor whenever he could get it, though particularly abstemious when in health, and lingered on for three weeks at Shupanga, dying on the 28th October.

Thus in the course of three months the three naval officers detached from Owen's surveying vessel succumbed to the hardships and unhealthiness of the country. It is a sad record, but thoroughly typical of the Africa of the past. To-day you may leave England in an ocean-going

steamer, step from her into a river steamer, and proceed to Tete with little more danger than in going up the Forth to Stirling.

Under altered conditions of transport much of the deadliness of the climate has disappeared; for undoubtedly the hardships, privations, and exposure of the old-time travellers rendered them most liable to attacks of the malarial fever, which their exhausted constitutions were unable to repel. Our knowledge, too, of these local fevers has greatly increased of late years by reason of the researches of the good and brave men who have gone forth to minister to the minds and bodies of those who dwell in these regions, so that it is well to hear again occasionally of those pioneers who suffered so much and did so well for the country that gave them birth.

After Owen's time no naval officers appear to have done much exploring work in the interior, nor, for that matter, anybody else, except the Portuguese. But Her Majesty's ships were always employed upon this coast, cruising for the suppression of the slave-trade, of which the delta of the Zambesi was a very hot-bed; so that many of the mouths of the Zambesi were known to them in this connection, and were notorious for the stream of Blacks that were constantly being sent forth into slavery. After the abolition of slavery in the West Indies and the Americas, not much attention appears to have been paid to this region until the reports of Livingstone caused almost the whole civilised world to become interested in the interior, and then the accumulated knowledge of the Zambesi delta led him to adopt this river as an easier means of reaching the far interior than the land route from the Cape, which was long and troublesome, or by the Rovuma, which river he had already proved to be useless for the purposes of navigation. The upper waters of the Zambesi he had, of course, discovered and explored previously.

The Zambesi delta may be said to comprise the Melambe, Inhamissengo or Kongoni, East Luabo, Muselo, Chinde, the Inhaombe (entered from the Chinde), Inhamaria (entered by the Inhamhona or Maria mouth), and possibly also the Linde. So that the river has eight mouths through which to pour forth its waters, all of which are probably brought into use during the rainy season, though only two are useful for navigation, the Chinde and Kongoni, and only one of these is available for large steamers, viz., the Chinde, the bar of which carries a depth of 19 feet at spring-tides. The Kongoni carries 5 feet less; whilst the others are quite impracticable by reason of their dangerous bars. It is probable that of these eight mouths only two, or three at most, have ever been available for navigation at the same time, but it is possible that they may all of them have been open in turn. But, so long as the mighty river sends down the quantity of water it now does, it is safe to assume that there will always be one mouth at least available for traffic. And so long as the formation of the junction of the Chinde with the Zambesi remains as it is, I am of opinion that it must be the Chinde mouth. My reasons for this assumption will appear later on, when the ways of these rivers come under consideration.

During more recent years the Kongoni has been considered the only practicable mouth, and it was by this that Livingstone entered the Zambesi. He makes mention of another, which he calls the secret mouth

of the Portuguese, and which I am inclined to believe was the Chinde mouth. But it was not until 1888 that Mr. D. Rankin, a member of your Society, directed attention to the Chinde, which was found on examination to be far and away the best entrance into the Zambesi. As the Chinde has thus become the main entrance into Central Africa, whereby ocean-going vessels can avail themselves of a commodious port and discharge and receive cargo in safety, I think that scant recognition has been accorded to the man who first directed attention to it.

There have always been many stories current about these different mouths of the Zambesi in connection with the slave-trade, one of which was to the effect that the boats of H.M.S. *Sappho* had chased a slaver into one and out at another. When I came to be more closely acquainted with the locality, it struck me that possibly the Chinde might have been one of these mouths, and discovering that Captain Montagu Burrows, R.N., now Chichele professor of Modern History in Oxford University, had been a lieutenant in H.M.S. *Sappho*, I wrote to ask him if he could supply me with any information upon the subject. His reply is so interesting that I cannot do better than give you extracts from it in his own words :—

"The story you have heard of my chasing a slaver into one mouth of the Zambesi and out at another is not true, but it might easily have grown out of what took place whilst I was in command of the boats of H.M.S. *Sappho*.

"On one occasion I chased and burnt a dhow several miles up the Quilimane River, and on another was successful, after crossing the dangerous bar off the mouth of the river several times, in bringing out the Brazilian brig (or barque) *Triumphante*, which was condemned at the Prize Court at Cape Town, . . . in December 1845.

"Either before, or soon after that date, I was sent to explore an opening in the land which we believed to be the Luabo.

"At that time there was no knowledge of what we called the Quilimane River, which was supposed to be one mouth of the Zambesi. I think the idea of further exploration was occasioned by frequent accidents which had befallen the boats of other ships on the Quilimane Bar. It had a very bad name on the station, but by careful calculation of tides and always selecting the time of high water, our boats never suffered; though I believe it fell to my lot to take them over ten times as often as others had done.

"I think it very probable that the river we explored was the Chinde mouth of the Zambesi. To our surprise we found no bar, and sailed for ten miles or more up a noble river navigable for ships.

"I made careful soundings and some sort of sketch of the banks at the mouth, all of which were no doubt transmitted to the Admiralty by my Captain.

"When I met Livingstone at Oxford in 1858 I told him about the expedition; at least I feel sure I did. At any rate I mentioned it to Bishop M'Kenzie, who was first Bishop of the Universities Mission to Central Africa. I think we owe the further knowledge we possess of these various mouths to the attention drawn to the great river by Livingstone."

It seems probable therefore that these mouths must have been well known to Portuguese and others engaged in the slave-trade, but it was manifestly to their advantage to keep the knowledge to themselves.

The Chinde mouth has its bar, which in its formation is similar to most other bars, inasmuch as it is an accumulation of the detritus which the river has deposited across its own mouth. But the channel by which the Chinde mouth is entered from seaward is somewhat different, because it is not so much a channel over, or through, the sand-bar as a channel round one end of it.

The reason of the channel taking this turn, almost at right angles to the trend of the last bend of the river, appears to be due to the constantly blowing S.E. wind keeping the sand banked up across the mouth, and to the fact that Mitaone Point juts out, beyond Foot Point, from the coast line, and so gives the first deflection to the southward of the discharging river-water, the tendency of which, if undeflected, would be to erode a channel straight out through the sandy deposits.

In the event of a heavy and sudden rainfall causing an unusually powerful spate, it is probable that, for a time, the mighty outpour will force its way straight through the sand and out into the ocean. But under ordinary circumstances the situation and trend of the tongue of Mitaone Point will cause the deflection that turns the scour to the southward and keeps the channel open.

That this channel remains fairly permanent is an established fact, for it appears to be very much the same to-day that it was in 1888, and vessels are now using it constantly. The other day in London I met the captain of the Union Company's steamer that plies between Kiliman and Chinde, and he assured me that he considered the channel to be improving, if anything.

With well-constructed beacons, and a few intelligent sea-faring men to keep them carefully in position, and sound the best water over the bar pretty frequently (for probably the very best water may shift a few yards one way or the other occasionally), the port of Chinde would be available for vessels of 13 to 14 feet draught all the year round at any ordinary high tide. Vessels of 16 or 17 feet draught would be able to go in and discharge at any ordinary spring-tide, with fair weather; and, of course, it is well known that there are many thriving seaports blest with no greater depth of water than this.

As to the length of the vessel, a point upon which I have very often been questioned, nothing afloat is too long to go into the Chinde Port, for the navigation is of the simplest, and all the captains of the steamers frequenting the port, that I have spoken to upon the subject, say they would sooner enter Chinde ten times than some of the other places on the coast once. One of them is reported to have vehemently protested that it is better to enter Chinde all the year round, than to go into the Inhambane at all.

When I came home from Lake Nyassa in June 1892, there were on one day eight vessels in the Port of Chinde, six of which were sea-going vessels. These were a British man-of-war and two British river gun-boats, two Portuguese men-of-war, two German mail steamers and a

British mail steamer, besides the small steamer *Pfeil* belonging to Wissmann's expedition.

It was an interesting and reassuring sight, especially when compared with the condition of the settlement as we found it in October 1890, when we went in and built Her Majesty's river gunboats, *Herald* and *Mosquito*, on the waters of the Port of Chinde, because we were forbidden to work upon Portuguese soil.

During our expedition up the rivers Zambesi and Shiré, and a stay of nearly a year and a half upon their waters, we experienced none of the terrible trials and difficulties that beset Owen's men. Difficulties we had, but they were not such as to seriously affect the health, for our food was excellent, our quarters comfortable, and we had a jewel of a doctor.

In the earlier days of our river-work the Portuguese, naturally, did not strive their hardest to assist us, and the rivers themselves seemed to resent the intrusion by being as low and as disagreeable as they could be—lower and more disagreeable than they had been known for years.

As H.M.SS. *Herald* and *Mosquito* were the first British men-of-war to navigate the waters of the Zambesi and Shiré rivers, those waters having been declared common property, they may be said to have opened the doorway to the interior for all the nations and peoples upon earth. Up to that time there had been a disposition to regard the Zambesi as a private way, and it was navigated on sufferance and on payment of a considerable toll. Now you can cruise up and down those rivers as often and as long as you please, and, provided you do not land, you are under no more restrictions than if you were upon the high seas; directly you land you, of course, become amenable to the law of the country in which you find yourself, just as in any other part of the world.

This opening of the doorway may be of sufficient interest to warrant my briefly showing how it was done, especially as the means adopted were in some particulars quite unique.

The idea of section-built steamers was not new, but the application of the system on this occasion, when permission was refused us to build upon Portuguese soil, was a happy thought. Hitherto the sectional system had been adopted mainly for convenience of transport and easy erection in places where there was no skilled labour, and the sections had nearly always been put together upon the shores of the water they were intended to float upon, not upon the water itself.

We arrived at Zanzibar on 12th July 1890—the officers and crews in H.M.S. *Humber* and the sections of the gunboats and heavy stores in the SS. *Buccaneer*—but, negotiations having hung fire in Europe, we did not leave that place until 3rd September. On 9th September we anchored off the Chinde—H.M.SS. *Redbreast* and *Humber* and the SS. *Buccaneer*—and forthwith sounded the bar carefully.

Next day, 10th September, at high water, the three vessels went in without any difficulty and anchored abreast of what is now the British concession.

The work of building was at once proceeded with. Section after section was hoisted out of the hold, lowered into the water, floated into

position ahead or astern of its fellow and bolted to it. By the 12th five sections of each vessel had been bolted together. It was a busy time for all, but the zeal with which every one buckled to the work was good to behold.

On the 14th both hulls were completed, the fitting of the decks, deck-houses, machinery, etc., went ahead at the same rapid rate, and the two vessels were equipped, stored, and ready for action on the 7th October, that is, twenty-seven days from start to finish. Next day, on the 8th October, H.M.S. *Redbreast* escorted us through the Chinde river into the Zambesi, and this trip of the *Redbreast* must always be regarded as a most excellent piece of seamanship and pilotage, for it must be remembered that there is not a straight reach in the whole river; all the bends are sharp, and the channel is often not wider than twice the beam of the *Redbreast*, and it is doubtful if there was any place in the whole river where she could have been turned round without touching.

At Sombo, in the Chinde, we all anchored to await a further rise of tide. The Governor was then staying at that place, having one river gunboat in attendance upon him, the commander of which informed us that the Governor wished to see the officer in command, who accordingly visited his Excellency, and received his protest against our proceeding. However, we did proceed when the tide suited, and got into the Zambesi in the afternoon, the *Redbreast* having some difficulty at the last turn out of the Chinde into the Zambesi, but extricating herself from a dangerous situation in a most smart and efficient manner.

On the 9th, with the African Lakes Company's sternwheeler, *James Stevenson*, and thirty canoes and lighters under escort, we parted company from the *Redbreast* and started off for our struggles up the rivers. We soon came to grief, and spent the whole afternoon in trying to find a channel round Misery Point, as we called it when we came to survey the river afterwards, in remembrance of our first acquaintance with it.

Arriving at Nyangombe, we anchored to sound for a new channel, for the Portuguese had asserted that it was impossible for us to get beyond that point, as there was only 2 feet of water in the channel, while we, being heavily laden, drew over 2 feet 6 inches. Their report was correct; the usual channel was quite impracticable, but fortunately for us a new channel was at once found with deep water in it, through which we steamed with ease, and reached Vicentis on the afternoon of the 11th.

At this place our difficulties were with man, not with Nature, for the canoe men were so frightened by the Portuguese that they came and returned their money to us, refusing to go any farther. There was nothing for it but to distribute their cargoes amongst the already overloaded steamers. This was done, bringing them down to 2 feet 10 inches, and, each gunboat taking a big lighter in tow, away we went again on the afternoon of the 13th October, and the whole of us stuck hard and fast on a crossing at Luane de Viana. It took the whole of the next day to warp the *James Stevenson* and *Herald* over the shallows: the *Mosquito* was hauled over on the 15th, and we reached Misongwe. Next day near Santa Maria we had a similar episode, with very bad weather, and arrived at Morambala on the 17th.

After leaving Morambala on 18th we met some engineers of the African Lakes Company coming down river to repair the *James Stevenson*, who reported that the Portuguese had built a fort mounting seven guns on the river bank five miles below Chiromo, and that a Portuguese river gun-boat was lying close to it. On the 19th we reached Juau Makanga, now called Port Herald, and filled up with wood.

It had been my intention to collect the whole flotilla at this place and enter British territory as one fleet; but the Portuguese tactics had reduced our thirty canoes to five, and it was doubtful whether these would be able to follow on. So, with boilers and engines well protected with patent fuel, and the rest of the vessels barricaded with provisions, awnings, etc., we decided to push on, and left Port Herald on 20th October.

At 3.30, near the fort, the gunboat met us; her commander told us he had orders to stop us, but acknowledged that he was unable to do so, and therefore handed in a written protest against our proceeding. He then said that the commandant of the fort had similar orders, and could stop us, for he had guns mounted. A letter was sent to the commandant, informing him that we were going on to Chiromo at once, and any one attempting to stop us by force must be responsible for the consequences, which would most assuredly be very grave.

We anchored below the fort in a most favourable position for dealing with it and the gunboat, and I landed to interview the commandant. Finding we were determined to go on, he said he was not able to carry out his orders to stop us, because we had come up so quickly that his fort was not ready. He, too, handed in a written protest. It was not to be supposed that we could wait until he chose to complete his fort, so we went on. This was the last scene of the first act in Portuguese territory, for an hour or so afterwards we anchored in Chiromo, off British territory.

The passage of the rivers thus took thirteen days to complete, every day full of incidents; some interesting, some amusing, many by no means agreeable, a few even pathetic, but all of them so engrossing and occupying so much time that the days passed quickly.

During many trips up and down these rivers, we surveyed them from the Chinde mouth to Katungas, at which point the navigation of Shiré stops. The Zambesi, above its junction with the Shiré, we did not examine, as circumstances in connection with the affairs of the British territory necessitated our constant presence on the Shiré River.

The surveying work had to be fitted in with our other work, and I must say that a river is a most awkward thing to survey; it approaches Euclid's definition of a line, and as we could not get off our line, to get shots at it from outside, the work could not be thus simplified. However, by carefully fixing certain points at convenient intervals up and down the rivers, by astronomical observations for latitude, and running meridian distances between them and Mitaone Point, the work was reduced to sections, and pieced together afterwards.

To attempt to give any directions for the navigation of these rivers upon the lines usually adopted in sailing directions is not possible, for

there is nothing permanent about them; and what will probably strike the traveller in the Lower Zambesi is the lack of landmarks, but he will soon discover that landmarks would be of little real assistance to him, for the channels change so continually and so quickly. Tall borassus palms are conspicuous, but not often useful, since the bush fires of each year's dry season destroy many of them, and alter the distinctive forms of the clumps.

There is only one publication that I can recommend to those who may find themselves in a river steamer, from which they may obtain many useful hints, and which will cheer them in the first feeling of hopelessness that they will surely experience upon realising how utterly changeful and incomprehensible are the rivers and their surroundings. It is not an official publication, and probably its author never intended that it should become a standard work upon river-pilotage, but more real, useful information and striking descriptions of the everyday incidents of river-boat life will be found in it than in any other book I know. This *vade-mecum* is *Life on the Mississippi*, by Mark Twain, and although it may be considered somewhat out of place to mention such a book in this paper, I do so in all earnestness on behalf of others who follow after, and who will surely benefit by a perusal of it.

There appear to be certain laws that are followed, more or less closely, by all rivers, when circumstances permit. Perhaps the best known is, that in a free and unencumbered river the deep channel follows all the outer or concave bends, and that a deposit will be found under the lee of every point.

This law is clearly illustrated in the Chinde, but, whenever islands encumber the river, the general rule becomes complicated and uncertain, for it often depends upon which side of the island the channel is open—and these channels are never permanent. But in any case, if one channel is open, the other one will be a silt-trap, and upon this rule much depends. If one channel be closed, there will probably be an accumulation of sand under the lower point of the island that will deflect the water so that the deep channel on the other side may follow the inner or convex bend for some distance, so long as this passage remains open.

In channels between submerged sand-ridges and sandbanks, such as cross the river in its wider parts, the reverse of this rule is generally observed, and the deepest water is almost invariably close against the lower convex curve of the ridge or bank, as the channel winds backwards and forwards.

The action of the water running over these half-moon ridges is most peculiar and, to me, unaccountable. At such a curve the water rushes over the edge of the bank (which may not have a foot of water upon it), and seems to scour out a channel immediately; so that the convex face of the upper bank is steep, with a narrow channel following it closely, whereas the water rapidly shallows away to the concave curve of the bank next below.

Upon further consideration, it appears to me that this scouring process is due to the general flow of the river-water running through the channels, ofttimes at right angles to the direction of the flow of the

surface-water. Naturally, the whole volume of a river's water gravitates downwards to the ocean and, where the river-bed is suitable, it flows onward in one stream; but when the river-bed becomes obstructed by banks, and so unable to accommodate the whole stream, the surface-water flows on over the banks, but the remainder follows the sinuosities of the channels amongst the banks, curving continuously from one side of the river to the other. In these channels it drives at right angles across the trend of the surface-water, and along the line of collision particles are constantly whirled off; for the surface-water seems to have a tendency to drive into the channel rather than to flow over the stream-water.

Another puzzling and disconcerting characteristic of these cross-channels is the marvellous manner in which they curve back at the last part of their course, when nearing the opposite bank of the river.

In many cases the vessel's course, in those positions, is the opposite to that on which she entered the channel, and there is usually a very narrow, shallow piece of channel to be negociated, so close to the river's bank that there is scarcely room to turn.

These are difficult points, for in low-river time the ridges must be taken at good speed to ensure "rising" them; and once over them the vessel must turn, sometimes through an arc of 130°, in a distance of 30 or 40 yards, or she will strike the river bank—always hard and fringed with overhanging trees at these points—and come to great grief.

There appear to be certain localities where trouble may always be expected, such as Misery Point, Shupanga, Santa Maria, and others, where there may be two or three channels, only one of which will be available at one time, and the difficulty is to tell which of them it is. One of them may have been passed through on a down-river trip, but the chances are against it being available a week afterwards on the return.

On very shallow broad crossings the channels are very difficult to discover; especially at the first period of low-river, as the stream has not then had time to scour out its channels.

In these situations I adopted a simple but effectual expedient that I have not yet seen mentioned elsewhere. The flat may have, say, two feet of water upon it, with depressions of 2 feet 8 inches or 2 feet 9 inches, perhaps, which at first seem to follow no particular direction. By putting every one overboard, each with a bundle of reeds under his arm, with orders to wander about and stick in a reed wherever the water got up to his hips, the direction of the channel gradually became visible in a definite form. Having thus got the general lay of it, we then carefully staked out the best water.

At the junction of the Shire and Zambesi, the latter river is almost entirely blocked by banks and islands, so that vessels bound for Sena ascend the Shire river and pass through the Ziu Ziu, which, at one time only a sort of back-water of the Zambesi, now bids fair to become the main channel.

The Ziu Ziu and the Chinde rivers notably exemplify the rule already mentioned, that, of two possible channels, if one be open the other is a silt-trap—that is, the water scours out one and the silt fills up the other.

By noticing the angles at which the Ziu Ziu and the Chinde leave the Zambesi, it will be observed that the natural tendency of the silt would be to flow on past them to the lower channels, rather than take an upward turn into these two rivers. And, as already observed, so long as the land in the vicinity of the junctions remains as it is, these two rivers, the Ziu Ziu and the Chinde, will remain the deep-water channels, and the others will continue to silt up.

Morambala Marsh lies in a basin bounded on the west by the Makanga Hills (which stretch in an unbroken line from a point opposite Sena to abreast the mouth of the Ruo river), and on the east by the Pinda Hills which stretch from the north end of Morambala mountain to lat. 17° 9′ S. Its southern limit is distinctly marked, being bounded by rising ground at the junction of the Ziu Ziu and Shire, but its northern limit is somewhat indefinite, as the flat ground runs off from the foot of the Makanga range nearly to Port Herald. The marsh proper, however, may be considered to terminate to the northward about Shuonga; since at ordinary high river it is not completely covered above that place.

By all accounts, and from all appearances, the marsh is not so extensive as formerly, and does not flood to the same extent. To what causes this may be due it is difficult to ascertain. There are three which may account for the phenomenon:—the river may be falling year by year; it may be deepening its channel; the level of the land may be rising.

If the reports of Livingstone, Young, and others who knew the river some years ago, are to be accepted, there is evidence that the Shire is sending down less water every year; reports from Lake Nyassa would also seem to indicate a continuous fall in its level, which would, of course, account for the diminution in the Shire outfall. The Ruo is only a short mountain stream, yielding a very intermittent supply of water, and its floods are of brief duration, so that to the Lake alone must we look for a continuous source of water for the Shire.

As to the second cause there is no evidence, but every probability.

Of the third cause there can be little doubt in the minds of those who have experience of the quick growth and decay of the rank tropical vegetation which marks such localities. Each wet season produces a dense mass of reedy grasses and climbing-plants that attain a height of eight feet or more; each dry season causes their destruction. Such a continuous addition of decayed vegetation would surely raise the level to an appreciable extent.

It is possible that all three causes may be constantly at work, and that the Morambala Marsh will, in a few years, be no longer a marsh in the common acceptation of the word.

Lake Malombe appears to be another body of water that is diminishing. It lies twelve miles from the south end of Lake Nyassa, and is really a lake, although there has been a tendency of late years to show it on maps as a mere expansion of the upper Shire. Mr. H. H. Johnstone, C.B., computes its area as 110 square miles. The peculiarity of Malombe Lake is the fact that it is now very shallow, and its bottom covered to a depth of eight feet or more with soft mud,

the upper layers of which are not stiffer than good cream, and when disturbed by pole, oar, or screw-propeller, send off bubbles of air or gas to the surface.

Now, from end to end of the Shire, as far as I know it, its bed is almost entirely of coarse sand, the product of erosion; at any rate, nothing similar to Malombe mud is to be found in any other part of the river, so that I am disposed to attribute that mud to some local action, and not to deem it a deposit from the water of the Shire, which up to that point, and higher, is found to hold sand in suspension, but nowhere deposits soft creamy mud. I should not be surprised if it turned out that the mud proceeds from a spring, or is a large bed of China clay.

This question of disappearing marshes, diminishing lakes, and shallowing rivers is one of great interest and importance to the country, and is exercising the mind of every one to whose notice the fact is brought. Evidence of the fact is plentiful and convincing, but of the direct cause of this drying-up there appears to be no real evidence of any kind—only the supposition that the rainfall is diminishing.

The latest remarks upon the subject are perhaps those to be found in the report of H.M. Commissioner for British Central Africa, who says:—

"Up to the present I have not been able to find an obvious cause for this diminution of rain-supply, unless it lies in the ravages of bush-fires and the destruction of the forests.

"I think, however, it may be taken as a fact that the rainfall of South Central Africa is slowly decreasing, and that in past ages all this country was more heavily forested than at present, and probably received a supply of rain scarcely inferior to that of West Africa. I still maintain that the chief cause of this deterioration lies in the bush-fires, which year by year widen their area of destruction and are by degrees practically reducing the country to a prairie condition."

And the Rev. Dr. D. Kerr-Cross, in the *Journal of the Royal Geographical Society* for February 1895, speaking of the plain of the Konde country at the north end of Nyassa, says:—

"A great change is coming over this plain, owing, as the natives say, to the drying-up of the lake. Yet the Nyassa must have occupied its present level for a very long time, as there are found huge baobab and banyan trees quite near the edge of the water, and these, according to most authorities, indicate a sameness of level for several thousand years.

"Still, to all who for some years have lived on the lake-shore, there is an obvious fall of between six and ten feet, say, within the last ten years. When I first saw Karonga it was one great banana plantation; now, owing to the decrease in the rainfall and the fall in the level of the Nyassa, this plant does not grow in anything approaching its former luxuriance."

From this latter statement it would appear that the drying-up is quite a recent occurrence, and this would seem to confirm the statement made to me by many old natives, to the effect that in former years there was a much heavier rainfall in the Shire-Nyassa districts than is now experienced.

If this be the case, it then becomes necessary to inquire into the history of the annual bush-fires, and should these be discovered to have lately become more devastating than during previous periods, to them might naturally be attributed the diminished rainfall. If no proof of this be forthcoming, it is possible, then, that the rainfall may be found to wax and wane in long recurring cycles.

The natural conditions affecting the southern end of the mid-continental waterway having now been dealt with at some length, the scope and nature of this paper permit but a brief glance at its political and strategical importance. The fact that nearly all the Powers that were signatories to the General Act of the Conference of Berlin, of 26th February 1885, have territory along its track will indicate its political importance, and should tend to ensure the provisions of the Act being carried out—in the spirit as well as in the letter.

During the preparation of this paper France has claimed the right of pre-emption of the Congo Free State, showing unmistakably the importance that Power attaches to a country abutting upon this natural highway to the headwaters of the Nile.

Great Britain has two Protectorates through which it passes—that on the headwaters of the Nile, and British Central Africa. Already the British Central African Administration has through communication from the Indian Ocean to the south-west corner of Lake Tanganyika, from whence the lake affords 400 miles of waterway capable of carrying onward to the north vessels of the deepest draught. At the north end of Tanganyika only a plateau 180 miles in width separates the two lakes: this is the "wasp's-waist," the loss of which to Great Britain all Anglo-Africans deplore.

By communication established between Lakes Victoria Nyanza and Tanganyika two British Protectorates are brought into close relation with the outside world, and with each other, at a cost that is trivial compared with that of any railway from the coast.

As to the relative costs of the maintenance of the two routes, there can be no comparison, for, as already pointed out, nature keeps up the permanent way along her own route free of cost, whilst it is acknowledged that a waterway is the cheapest of all means of transport.

It is manifest, therefore, that strategically, commercially, and financially the natural route, by lake and river, is the right way to the British Protectorates lying along its shores, and the attention of our Government and of our financiers should be fixed upon it; for between them they could remedy the errors that have been allowed to creep in during past years.

A MAP SHOWING THE MORTALITY FROM MALARIAL FEVER IN ITALY DURING THE THREE YEARS 1890-91-92.[1]

THE Statistical Department of the Italian Government has published a map, showing the provinces and communes of the kingdom infected by malaria, and its intensity in each.

This map has been drawn from the registers of deaths from malaria that occurred in each commune during the three years 1890, 1891, and 1892.[2] From these registers the yearly average of deaths from malaria was calculated for every 1000 of the estimated population.[3]

The death-rates thus obtained have been grouped into nine classes, containing respectively less than one death per 1000 of the estimated population, from one to two deaths, from two to three, and so on, up to more than eight deaths per 1000 of the estimated population.

On a map of the kingdom on the scale 1 : 1,000,000, the surface of each commune has been marked with colours of progressive intensity, one for each of the nine groups of death-rates. The communes in which, during the three years 1890-91-92, no death from malaria occurred are left blank. Those having the greatest mortality (viz. more than eight deaths a year per 1000 inhabitants) are coloured dark blue. The intermediate colours show other rates of mortality.

It will be seen from the map that the mortality from malaria differs very much from one region to another. During the three years 1890-91-92, there were in the kingdom 49,407 deaths from malarial infection, equivalent to a mortality of 0·54 per 1000 of the estimated population. But all the Alpine region, and the country at the foot of the mountains, up to 1000 feet above the level of the sea, is almost entirely free from the disease. Farther down, the middle and the lower portion of the great valley of the Po in Northern Italy is, for the most part, marked light, corresponding to a death-rate from malaria of one or, at the most, two per 1000 inhabitants.

Some exceptions are found in the districts about Vercelli and Crema, in which rice is very extensively cultivated, and in the communes around the marshes of Comacchio and Venice towards the mouth of the Po. It should be observed, however, that in the low-lying lands of the lower valley of the Po the cases of malarial infection are rather frequent, as is shown by the nosological statistics of the hospitals and of the railway employés;

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[1] A copy of the map, presented by Professor Bodio, may be seen in the Society's Library.

[2] The Department publishes yearly, since 1881, a report of the deaths in each province of the kingdom, under the heading of the diseases to which they were due. This account is furnished by entering in a separate schedule the declaration of the disease which in each case caused the death, signed by the physician or the surgeon in attendance, or by the medical man who conducts the post-mortem examination, and who gives the certificate for burial.

[3] The population of each commune has been estimated by adding to the number of the population existing on the 31st December 1881 (date of the last census) the excess of births over deaths during the years from 1882 to 1891. In this calculation it is impossible to take into account the changes in the population produced by migration from and to foreign countries, or from one commune of the kingdom to another.

but as these cases of illness are rarely fatal, the map, which shows only the deaths, indicates for such places a low intensity.

Along the Mediterranean shore the communes of Liguria and Tuscany, down to Leghorn and beyond, are almost free from infection; whereas the territory of Grosseto suffers severely, and the malaria spreads outwards, although to a smaller extent, in the surroundings of Pisa and Grosseto, and is also virulent in the Agro Romano (Campagna), where there are many marshes and uncultivated districts. The Pontine marshes, between Torre Astura and Terracina, are another seat of severe malarial infection. In the city of Rome the mortality is relatively low, being barely one per 1000 inhabitants, whereas in the Campagna surrounding the city it reaches three per 1000; though, in the worst season, the Agro Romano is to a great extent uninhabited, and the few labourers who remain there pass the evenings and nights in the city.

In the entire commune of Rome (city and country) the number of deaths from malarial fever has been rapidly decreasing since 1880. In that year there were 650 deaths; in 1881, 505; and in 1882, 488; the mortality decreased in the following years down to 139 deaths in 1892; they were 189 in 1893.

A third centre of severe infection along the Mediterranean is the territory of Salerno, around the ruins of ancient Pæstum; and places more or less infected are to be found in several localities of Calabria.

On the Adriatic slope of the Apennines there is a region heavily visited by the infection, beginning above the Promontory of Gargano, and extending southwards through Molise, Capitanata, and Basilicata, to the Ionian Sea. Terra d'Otranto on the extreme eastern point of the peninsula, and the western portion of the Gulf of Squillace, are also extremely malarious.

The continental region of the Peninsula, occupied by the Apennines and their spurs, is relatively free from malaria, some low-lying districts excepted in the territories of Abruzzo, Molise, Benevento, and Salerno.

The two principal islands, Sicily and Sardinia, have very extensive regions in which the rate of mortality from malaria is very high. In both islands the south-western districts, more directly exposed to the winds blowing from Africa, are especially affected.

It appears, from a glance at the map of malaria, that the regions at present most insalubrious are those which in ancient times gained a prominent place in history owing to their prosperity and civilisation—Populonia, Rusellæ, Vetulonia and Veii, in Etruria; Ostia, Ardea, Norba, and Terracina, in Latium; Pæstum, in Campania; Elea, Locris, Caulonia Scylaceum, Crotona, Thurii, Sybaris, Heraclea, Metapontum and Acherontia, in Lucania and the Brutii; Callipolis, Hydruntum, Sipontum, Venusia, in Iapygia; Aquilonia, in Samnium; Aquileia and Altinum, in Venetia; Henna, Syracusæ, Motyca, Hybla, Agrigentum and Drepanum, in Sicily; Caralis and Sulci, in Sardinia, localities flourishing for several centuries before the Christian era, are now changed into pestilential and almost deserted countries. But, as the Hon. L. Torelli has justly remarked,[1] not only was the drainage formerly well regulated in those

[1] *Carta della malaria dell'Italia illustrata da Luigi Torelli.* Florence: G. Pellas, 1882, in 4to.

places, so that cultivation was carried to its utmost limits, but not a few rivers were canalised and rendered navigable—a state of things which indicates activity, regular administration, and unceasing supervision. All this disappeared in the latter times of the Empire; the rivers and torrents began to inundate the fields, obstructing by their own alluvium their discharge into the sea, and thus multiplying the natural sources of malaria. Moreover, after the fall of the Roman Empire, which several of the Italian cities survived, succeeded the epoch known as the Middle Ages—an epoch of anarchy, violence, and confusion.

To the above causes of decay, common to all the countries of the great Empire, are to be added, as far as the coast regions of Italy are concerned, the incursions of pirates. The Saracens, and then the so-called Moors of Barbary, made frequent raids on the Italian shores, plundering the country and carrying off the inhabitants into slavery. Hence fortifications became necessary, and the inhabitants made use, as a matter of course, of the materials ready to hand in the great engineering works erected when the maritime cities were in the height of their prosperity.

The complete security of the Ionian seashore dates only from the present century, and the malaria, which existed even in ancient times, as is proved by the myth of the voracious Typhon, has prevented these depopulated regions from recovering their former splendour.

Now that Italy has awakened to new political life, it is her duty to recall the glorious traditions of the past, and to endeavour to revive the ancient civilisation of Latium, of Magna Græcia, and of the large islands, in its economical and social side.

LUIGI BODIO.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

MEETINGS HELD IN FEBRUARY.

On February 7th Vice-Admiral P. Colomb lectured in Edinburgh on "Reminiscences of Travel on board a man-of-war in the Past." Captain Hamilton Dunlop, R.N., presided, and General Sir R. Murdoch-Smith proposed a vote of thanks to the lecturer.

Admiral Colomb repeated his lecture before the Glasgow Branch on February 11th, the chair being taken by Sir W. Renny Watson.

On February 13th he addressed the Dundee Branch. Ex-Bailie Robertson presided at the meeting, and Mr. G. W. Baxter moved a vote of thanks to the lecturer.

On February 15th a meeting of the Dundee Branch was held to hear Admiral Colomb's lecture.

A meeting was held in Edinburgh on February 21st, when Commander Henry Keane, R.N., C.M.G., delivered an address on "An African Waterway." Dr. George Smith, C.I.E., occupied the chair, and a vote of thanks to the lecturer was proposed by the Rev. P. Barclay.

The Rev. Dr. John Ross, of Mukden, lectured on February 28th before the Glasgow Branch on Manchuria. Sir W. Renny Watson presided.

Meetings in March.

Sir W. Renny Watson will read his lecture on "The Hawaiian or Sandwich Islands," at Aberdeen on March 5th.

On March 7th Sir William Macgregor, K.C.M.G., Administrator of British New Guinea, will lecture in Edinburgh on the history and condition of the Possession.

It is hoped that he will also address the Glasgow Branch.

Mr. Trevor Battye, who has lately visited Kolguieff Island, will describe his explorations at a meeting to be held in Edinburgh on March 21st.

He will repeat his lecture at Glasgow on March 25th, and at Dundee on March 26th.

Captain Younghusband has arranged to lecture in Edinburgh on April 4th, and at Glasgow on the 6th. His subject will be "Chitral and Hunza."

Dr. Ross will repeat his lecture in Edinburgh, probably on April 18th.

Presentations to the Library.

At a meeting held on January 28th the Council expressed their acknowledgments to the private donors who during the past year presented the following works to the Society :—

An Australian Language as spoken by the Awabakal, by L. E. Threlkeld	The Agent-General for N. S. Wales.
The Wealth and Progress of N. S. Wales, by T. A. Coghlan	The Agent-General for N. S. Wales.
The History of Dulwich College, by Wm. Young. 2 vols.	The Author.
Journal of Mr. W. H. Tietken's Central Australian Exploring Expedition	?
Caminho de Ferro da Beira a Manica, por J. Renato Baptista	Geog. Soc. of Lisbon.
Brazilian Railways, by Chrockatt de Sa. . .	M. Lamoureux.
The Tangut-Tibetan Frontier of China and Central Mongolia. Travels of G. N. Potanin. 2 vols. (in Russian)	Imp. Russ. Geogr. Soc.
Geography of Asia, by Carl Ritter. *East Siberia.* (in Russian)	Imp. Russ. Geogr. Soc.
Hints to Travellers, by D. W. Freshfield and Capt. W. J. L. Wharton, R.N.	Royal Geogr. Soc.
Sulla Via di Roma, del Dr. Antonio Emiliano .	The Author.
Western Australia in 1893, by Francis Hart .	The Agent-General for W. Australia.
Internationales Archiv für Ethnographie, 1894 .	D. MacRitchie, Esq.
Scottish Gypsies under the Stewarts, by D. MacRitchie	D. MacRitchie, Esq.
Den Norske Nordhavs Expedition, 1876-78, vol. xxii.	Prof. Mohn.
Die Geognostische Verhältnisse der Gegend von Olmütz, von E. Tietze	The Author.
The Handbook of Jamaica for 1894, by S. P. Musson and T. L. Roxburgh	Alfred G. Nash, Esq.
Forty-four Photographs of the Transvaal . .	Baron F. von Mueller.

Four Photographs of Caucasians . . .	M. N. de Seidlitz.
Mémoires de la Section Caucasienne de la Soc. Imp. Russe de Géogr. livre xvi. . . .	M. N. de Seidlitz.
Photograph of Valerian's Bridge, Persia . .	John Craig, Esq., of Cheltenham.
Legatio Batavica ad Magnum Tartariæ Chamum Sungteium, per J. Neuhovium . . .	Dr. Hugh Cleghorn.
159 Photographs of France	M. James Jackson.
In Memoriam: Alex. L. Bruce . . .	Mrs. Bruce.
Mythology and Traditions of the New Zealanders, by Sir Geo. Grey, K.C.B.	The Author.
Atti del Primo Congresso Geogr. Italiano, 2 vols. .	The Committee of the Congress.
Anthologie aus der Suaheli Litteratur, von C. G. Büttner	Dr. Felkin.
The Clyde Sea Area, Part III. (*Trans. of the R.S.E.*), by Dr. H. R. Mill	The Author.
Het Paard onder de Volken van het Maleische Ras, Door P. J. Veth	Intern. Archiv für Ethnographie.
The Wealth and Progress of New South Wales, 1889-90	Col. Bailey.
The Fifteen Decisive Battles of the World, by Sir Ed. Creasy	J. Gunn, Esq.
Elementary Lessons in Physical Geography, by Arch. Geikie, LL.D., F.R.S.	J. Gunn, Esq.
Recreations in Physical Geography, by Rosina M. Zornlin.	J. Gunn, Esq.
Two Atlases, by R. & I. Ottens, Amsterdam, and Maps of Scotland, Ireland, and France . .	George Lorimer, Esq.

The *Raccolta di Documenti e Studi dalla R. Com. Colombiana*, presented by Clements R. Markham, Esq., C.B., has already been referred to in the *Annual Report*.

Franklin Commemoration.

Fifty years ago Sir John Franklin sailed from Greenhithe on May 20th on his last and ill-fated expedition, and on June 2d touched at Stromness, the last British port on his course. At a meeting of a special committee appointed by the Council it was resolved to hold a commemoration on June 4th, the nearest convenient day to June 2d. Several distinguished men connected with Arctic research have promised to attend the meetings, and there will be an exhibition of Arctic relics and pictures and other objects illustrative of Polar life and travel. The Royal Geographical Society of London will hold a commemoration in May, and the two Societies are co-operating heartily with a view to exciting public interest in Polar exploration, especially in the Antarctic regions.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

Iceland.—Last summer Herr Thoroddsen turned his attention to the southern and western coast-lands, and also visited the little-known north-eastern corner of the great snow-field. Near Öræfa, on the south-east coast, Herr Thoroddsen had an opportunity of studying the larger glaciers and the changes that have taken place through their action, and by volcanic eruptions, within historic times. The great Breidamerkr glacier, which at the beginning of last century lay four or five miles from the sea, has advanced so far that it is now separated from the sea by a strip of land only 280 yards broad. At the eastern corner of the Vatnajökull, where it is hemmed in by an alpine land containing numerous lakes, considerable alterations have been made in the map. The Heldingafell and the surrounding mountains are composed of palagonite breccia overlying basalt, whereas the limit of this breccia was hitherto supposed to lie farther to the west. Near Snæfell also the topography was corrected. The great Jökulkvisl, which flows into the Jökulsa, was found to have its source in a lake at the edge of the Vatnajökull, to the south of Snæfell. Near Öræfa a small wood of birches twenty feet high was found; the highest known birch in Iceland is near Lagarfljot, and has attained a height of nearly thirty feet.

The Waters of the North Sea in their relation to Fisheries.—In *Natural Science* for January, Mr. H. N. Dickson discusses the physical properties of the water of the North Sea in connection with fish life. It will be remembered that Professor Pettersson, in the article published last year in the *Scottish Geographical Magazine*, showed that Swedish fisheries depended on the influx of ocean water, rich in oxygen, into the Skagerack and Kattegat; and it was in consequence of his representations that the *Jackal* was sent out, in August and November 1893 and February and May 1894, to survey the region to the north and east of Scotland and the northern and western borders of the continental plateau, and to investigate there the origin of this water. Observations were also made simultaneously by Swedish, Danish, German, and Norwegian vessels in different parts of the North Sea, and a joint report on part of the work is now in preparation. The deep narrow channel between the Færoe and Shetland Isles forms a submarine gulf opening out from the Norwegian Sea, and cut off at its southern end from the Atlantic by the Wyville Thomson ridge, which rises to within 300 fathoms of the surface (see map facing p. 352, vol. x.). It has long been known that the lower layers in this channel consist of Norwegian water at the low temperature of 31° or 33° F., and that Atlantic water flows northwards over the ridge with considerable velocity. A comparison of the observations of the *Jackal* with those of the *Porcupine* and *Knight Errant* showed that in 1893 cold water rose nearer to the surface at the southern end of channel, and that warm water descended lower at the northern end, than had been found to be the case by earlier expeditions. Hence it appears that the Atlantic stream was stronger and the "reaction current" consequently greater, and this again was probably due to the abnormally high temperature in the north-eastern part of the Atlantic basin during the summer of 1893, and the consequently high level of the surface.

The stronger the Atlantic current, the stronger the undertow; and hence a compensating arrangement is set up, the Atlantic water, being cooled by mixture

with the underlying water, tending to sink and lose its horizontal motion. Except, then, when strong south-westerly winds force the bulk of the current into the Norwegian Sea, a mass of Atlantic water collects at the northern end of the Færoe channel, which by the influence of the earth's rotation is deflected to the right. Thus a mass of water, varying considerably in volume from season to season and from year to year, here seeks admission into the North Sea, and the amount of air contained in it (the surface temperatures of the two basins being widely different) will vary in inverse proportion to the quantity of Atlantic water present.

As to the agencies which force this water into the North Sea, Mr. Dickson cites, firstly, the strong tides which set north-west and south-east between the Orkney and Shetland Isles. The quantity of water pumped in by these tides must, however, be small. Then there are surface-currents; in winter, when the winds blow strongly, the surface-water will be driven north-eastward, out of the North Sea altogether, or eastward towards the Continent; there will be little or no current on the western, British, side. In summer, again, the winds are light and variable, and the surface of the North Sea is warmer than that of the Færoe-Shetland channel, and, being consequently higher, its surface-waters tend to flow northwards and westwards. Evidently, then, if the western coasts of the North Sea receive any part of the oceanic water, it must be by means of some current flowing beneath the surface. At the end of winter, or in early spring, the water in the North Sea, though its salinity has been lowered by the addition of fresh water from the rivers, is, on account of its low temperature, due to the influence of the land, decidedly denser than the oceanic water outside. As the temperature rises, the surface-water becomes lighter and tends to flow outwards, while the upper layers protect the lower strata from the warmth of the atmosphere. Accordingly, in early summer there is a cold underlayer of North Sea water, somewhat fresher than the oceanic water, but denser owing to its lower temperature; and upon this lies a warm layer of North Sea water, fresher and lighter than the oceanic water, and tending to flow over it. Hence a gradual process of mixing is commenced, and between the oceanic and North Sea water a ridge is formed, which, at first probably extending northwards from the Shetlands, moves eastward as the season advances, and leaves a path open for the oceanic water to move southwards between it and the land as a bottom-current. With the approach of winter this current is cut off again by the effects of falling temperature and rising winds on the distribution of the waters. The conditions regulating the amount of oceanic water admitted into the North Sea are naturally very complex. The observations of the *Jackal* leave, however, no doubt that the circulation described actually took place in the summer of 1893; and the observations of the *Drache* and other vessels in former years indicate a similar arrangement of water-layers.

There is abundant evidence that oceanic water reaches the east coast of Scotland as a bottom-current just at the time when the herring-fishery begins. Large catches of herring are usually made in patches of cold water, which, as the prevailing winds are off shore, is no doubt oceanic water welling up from the bottom. Whether this water actually contains a larger amount of oxygen than that it displaces, can only be ascertained by the analysis of samples; and the question whether the herring come with the oceanic water must be decided by zoologists. For these purposes Mr. Dickson thinks that two vessels are necessary, one to keep watch in the Færoe-Shetland channel, and the other to examine the inshore waters at the same time. Mr. Dickson illustrates by a chart the movements he describes.

Lake Maggiore.—Professor Olinto Marinelli has measured with a planimeter the areas of zones of Lake Maggiore enclosed between isobaths at every fifty mètres, on the *Carta idrografica del Verbano* (scale 1 : 50,000) issued by the Italian Hydrographic Department. The total area he gives as 81·9 sq. miles, and the total volume he calculates to be 8·93 cub. miles. The volume divided by the area gives about 576 feet as the average depth, or about 47% of the maximum, which is 1220 feet. For comparison, Prof. Marinelli quotes the results of similar calculations for the Lake of Geneva. The volume is 21·43 cub. miles, and the average depth 507 feet, or 50% of the maximum (1017 feet).

M. Forel, who calculates the volume at nearly the same value, estimates that the Rhone, which transports yearly over 35 million cubic feet of alluvium to the lake, would fill it up in about forty-five thousand years. Data to calculate the period for the Lago Maggiore are wanting; but, supposing the erosion of its basin to be proportional to that of the Rhone, it would be filled up in twelve thousand years. Again, for the degradation of the valley of the Reuss above the Lake of Lucerne 0·18 mm. annually has been given, and for the Kander 0·28. The basin of the Verbano, excluding the basins of the lakes of Orta and Lugano, has an area of 2123 square miles, and at the former rate of degradation the Lago Maggiore would be filled up in thirty-seven thousand years, at the latter rate in twenty-four thousand.—*Geografia per Tutti*, December 31st.

Corfu.—In the winter of 1892-93 M. Rabot made a long sojourn in this island. At that season the climate is very mild, the January mean being 50·5° F., which is higher than the mean temperature of the month at the winter resorts on the Mediterranean coast. The rains, however, from October to April are very abundant; the number of rainy days is seventy-seven on an average, and sometimes reaches ninety-five; then a dry season sets in which lasts for six months. Topographically the island may be divided into four regions. At the north stands the mountain mass of Pantokrator or San Salvatore, 3000 feet high; then there is a region of rounded hillocks backing up against a rocky ridge stretching along the west coast. Beyond this the ground rises and forms on either side a range of small mountains, 1600 to 2000 feet high, enclosing the valley of the Mesongi. More towards the south the country becomes flat, interrupted only by a few small g oups of hills. The island consists entirely of limestone formations, through which some of the water flows in subterranean channels. The Pantokrator is a reduction of the Illyrian Karst, and in other parts of the island *katavothra* are numerous, giving origin to springs at the foot of the mountains. Another hydrographic feature is the abundance of lagoons along the coast, hotbeds of malaria. The soil, plentifully watered, is extremely fertile, and supports a luxuriant vegetation.—*Comptes Rendus* of the Paris Geographical Society, Nos. 18 and 19, 1894.

ASIA.

The Altyn-tagh.—In a letter from Sa-chan or Sha-chan, dated May 2nd, M. Roborofski describes an excursion he made to the Altyn-Tagh (*Izvestiya*, Tom. xxx. No. 4). Travelling south-west and then west, he came to the northern slope of the chain after a march of 165 miles. The flank is here covered with a layer of loess, on which, at a height of 7500 to 10,000 feet, are excellent pasture-lands, where graze the flocks of some sharp Chinese, who make a profitable living among the Syrtyn Mongolians who sometimes encamp there. Here passes the road to Lob-nor. Below the main range runs northwards a stony valley, 16 to 25 miles broad,

and beyond it rocky heights stretch from east to west, mingling on the north with the sands of Kum-tagh, along which runs the winter road to Lob-nor. There mountain sheep and wild asses were seen, and numerous tracks of wild yak, though these animals were never caught sight of. The weather was bad, storms and dust-clouds being experienced daily. The range was crossed by the Shiny-khutull pass at a height of more than 12,000 feet, and a descent was made to the Khuntei-nor. Here a dreadful storm came on. The sky at midday became dark, illuminated only by a russet gleam. The horses could not stand, and the camels also lay down. Fine pebbles striking against the face caused intolerable pain, and the dust drew tears from the travellers' eyes. Three times M. Roborofski made an attempt to continue his journey, but was obliged to turn back, and the animals suffered severely from the storm and cold, for the thermometer fell to 9° F. Finally, however, the party reached the Khuitun-nor and the Sukhain-nor and Bulunghin-nor beyond. The two latter are fresh, and are connected by the river Kolin-gor, unfordable at the time, which flows from the Bulunghin-nor into the Sukhain-nor. At the Khuntei-nor and the Khuitun, many wild camels, asses, and antelopes were seen. Turning northwards from the Bulunghin-nor, M. Roborofski recrossed the range by a very easy pass, the Tashyt-khutull, of about the same height as the other—that is, over 12,000 feet. On leaving the range he turned his steps to the gorge by which the river Dan-ho cuts through the advanced rampart of the Nan-shan. On March 30th he returned to Sa-chan, having travelled more than 400 miles in twenty-one days.

M. Koslof had also made an expedition, having visited the town of Yui-myn-sian on the east and traced the Su-lei-ho for 200 miles to where it issues from the mountains. He returned on April 22nd, having travelled 400 miles in twenty days. For previous explorations by these travellers see vol. x., p. 540.

On May 10th M. Roborofski intended to set out for the purpose of exploring the flanks of the Nan-shan to the east of Kuku-nor.

The Kapuas in Borneo.—Letters are published in the *Tijdschrift van het K. Nederlandsch Aardrijksk. Genoots.*, Deel xi. No. 8, from Prof. Molengraaff. He left Putus Sibau by boat in the middle of June, and on 3rd July reached the Pangkalan Mahakkam, where the route overland begins, and on the 14th came to the Sungei Penanei in the Eastern Province. On the way he climbed several mountains, among them the Bukit Betung (B. Lekujan on the map), 3900 feet high. It is a large volcano, fallen into ruins, lying on the boundary of the Eastern and Western Provinces. From its summit there is a fine view on the one side over the table-land of the Ulu-Mahakkam, the panorama being, as it were, divided into two by the B. Penanei in the foreground. On the other side, in the Western Province, the eye is most struck by the B. Terata, a very steep volcanic ruin, from which streams descend in silvery white falls into the deep, narrow valley of the S. Leya. The whole of the south-western part of the panorama is occupied by similar fantastic isolated mountains, some pyramidal stumps, others like huge castles half in ruins. On all of them sparkle here and there steep walls of white or red rock, contrasting sharply with the surrounding green, and giving colour and relief to the landscape. This is the great volcanic region of Central Borneo, hitherto wholly unknown. Due west lies the deep Bungan valley, picturesque from the sharp limestone rocks which rise from its midst in a row of white pillars. To the north-west the scene is of quite a different character; as far as the eye can see, mountain ranges succeed one another, all running from west-south-west to east-north-east. All are covered with dense forest; the highest, the Punu and Ulu Tanjan, are shrouded in clouds, and the whole scene is grand, but sombre and almost depressing.

These are the chains of the Upper Kapuas, the home of the Bukats, dreaded as expert head-hunters and envied for the beauty of their women. The climate of these mountain-lands is beautifully cool, and the water is excellent, crystal clear and fresh. Owing to disturbances among the natives, Herr Molengraaff was unable to descend the Mahakkam, as he had intended, and was obliged to return to Putus Sibau. He has formed one of the most important collections of fossils ever obtained in the Dutch East Indies.

In a later letter Herr Molengraaff reports that on September 4th he made an expedition from Smitau, ascending the Sungei Bunat and the S. Telaung, and on the 16th starting overland from the Tetaung. Eight long days' march past the B. Beransa, the B. Babas Hantu, and the Madi mountains brought him to the S. Kerewui Melawi. Descending the river to the S. Lekawai, he ascended the latter to the farthest Dyak house and climbed the B. Sedarung, passing thence into the unknown alpine land, the highest point of which is the B. Raja, the highest mountain in the Western and Southern Provinces, 7474 feet above sea-level. Having climbed this mountain, he reached the watershed by the Rowui, a tributary of the Sahai, which in its turn falls into the Samba, and looked down into the Southern Province. The watershed lies at a height of 1650 feet. The whole district, including the Samba, has never been visited by a European. For earlier letters from members of this expedition, see vol. x. p. 600.

AFRICA.

Tafilet.—In 1893 a young French traveller, M. Gabriel Delbrel, after many adventures, succeeded through the friendship of Mulai-Abdul-Azis, now Emperor of Morocco, in visiting Tafilelt (so he spells it) in the company of members of the Court. Several travellers have passed through, but none has been able to give more than a few vague details of the district. René Caillé, one of the first Europeans to penetrate as far as Timbuktu, stayed there several days in 1825, and the Viscount Ch. de Foucault passed to the north of it in 1883. Gerhard Rolfs visited several of the centres of population of the oasis in 1862 and 1864, and he alone collected some definite information about the country.

Tafilelt is the cradle of the reigning family of Morocco, and is the place of exile to which the Emperor sends the members of his family whose intrigues he fears. The oasis lies approximately in 31° N. lat. and 4° 20′ W. long., on the most advanced spurs of the southern slope of the Atlas. On the north it is bounded by the oases of Mdaghra, Maarka, and Tizimi, and on the south by the Jebel Adrar; on the east rise the peaks of Gerfs, and on the west the prolongation of the hills of Tizimi. The altitude of Tafilelt is about 2000 feet, as M. Delbrel was able to determine by the help of an English barometer given to a native by a Scotch non-commissioned officer named Macleane, who, after risking his life several times in the attempt, succeeded in reaching Tafilelt only to be arrested and sent back to Morocco as soon as he arrived.

The climate of the oasis is unhealthy, owing to the great difference of the day and night temperatures. In November 1893 the shade temperature was 95° to 104° F. at noon, and the thermometer sank to 30° between midnight and two o'clock in the morning. This great range of temperature produces several maladies, especially fevers. Moreover, water is scarce, and most of the pits yield only briny water, so that the inhabitants have great difficulty in quenching their thirst and watering their herds. The Wed Ziz traverses the oasis, but it is only a dry bed since the Seba and Uled Zora Arabs have constructed a dam, and with the water thus entrapped have made the oasis of Tizimi the paradise of Southern Morocco. In the southern part of El-Rorfa, on the east, is a large sheet of water collected by

irrigation canals from the Wed Ziz and retained by a dam, and a few wells of fresh water are found in the *ksors* (fortified villages).

According to a census taken by the order of Mulai Hassan for fiscal purposes, the inhabitants number 45,000. Tafilelt can send to war 2500 to 3000 cavalry and 12,500 to 15,000 infantry; but owing to party divisions the inhabitants are not able to prevent their neighbours in Tizimi from cutting off their water supply. The population consists of the Shorfa (plural of Sherif) Mulai Ali, members of the exiled Imperial family, the Filala, who form the majority, Arabs and Harratin agriculturists, and a few Jews. The Shorfa, the aristocracy of the country, dwell in the principal *ksors*, and the Filala, Harratin, and Arabs are their slaves, cultivating the lands and paying a fifth of the produce to their masters. The Filala are Berbers, and speak a dialect of Shellach similar to that of the Berbers of Eastern Morocco. They are tall and thin, of dark complexion, robust and inured to fatigue. Always at feud with one another, their constant combats keep down the population, for every year whole families fall victims in these civil commotions Their dress consists only of a shirt, linen pantaloons, and a burnous. Most of them go barefooted, but a few wear sandals of ox-hide or palm-leaves. Their chief arms are a sabre, musket and flint-lock pistol, and an enormous tomahawk, which they use with great dexterity.

The *ksors* and the dwellings of the Filala are built of earth mixed with dung. The cabins usually consist of one room divided into two compartments by a curtain. The Filala are of an irritable disposition and easily roused to deeds of violence, perhaps owing to the effect of the hemp which they smoke to excess. They are exceedingly avaricious, and are not given to entertain strangers. Their food consists of *arira*, a kind of broth made of rancid butter melted in boiling water and seasoned with all kinds of spices. This, with dates and skimmed milk, constitutes the breakfast. The dinner consists of barley-cakes toasted on an earthen dish, and rancid butter, followed by two or three cups of English tea. The better classes eat *kuskussu*, made of barley or maize flour, steamed after a certain preparation and covered with boiled meat; or lucerne cooked in the broth. Mutton-fat in the middle of a cake of barley cooked in the oven is a favourite dish; and the poorer people eat potatoes roasted in the ashes, or ears of unripe maize toasted and seasoned with salt.

The women are well made and, though very brown, have pleasing faces. Only those of the wealthier classes veil their faces. Their dress consists of some yards of cotton wound round the body and girded with a long sash of silk or cotton. As ornament they wear a bangle of silver or copper, according to their means, above the ankle. They weave clothes and attend to all the work of the household, making butter by swinging the milk in a goatskin attached to a tripod. They are sold in marriage for a sum much less than is customary in other Arab tribes—about £8.

Dates, of which there are several qualities, are almost the only natural product of Tafilelt. Hemp is largely grown for smoking, and maize is an important crop. On the lands of the Governor and of the members of the Imperial family, cereals are sown, and potatoes, parsneps, melons, and pumpkins are planted. The few gardens of the oasis contain figs, crab-apples, apricots, oranges, lemons, and a few vines. The only part of Tafilelt which is not cultivated is the sandy plain in the centre of the oasis. All the rest is carefully tilled, and not an inch of ground is wasted; but water is scarce, and when the crops are spared by the drought they are often destroyed by swarms of locusts, which in a marvellously short space of time strip the country of every trace of vegetation, leaving the inhabitants a prey to famine.

Industries are in an advanced stage. The dates are dried with care, and goatskins are made into morocco-leather. Elegant articles of pottery are also manufactured, and flint-lock guns, poignards, and articles of morocco-leather, such as saddles, bags embroidered with silk, etc. The women are very industrious, and weave the clothes for the family, woollen blankets, and carpets. Mats, baskets, etc., are made from palm-leaves, and bags to hold the dates. The Jews manufacture massive silver ornaments and iron implements, and distil spirits from the dates. In spite of the bad state of the roads, a certain amount of traffic is carried on with Morocco. Cotton cloth, spices, tinware, tea, silks, and cloth are imported from the towns of Morocco, and many European wares also find their way through Algeria. Trade in slaves brought from the Sudan through Tuat is very brisk.

Animals are numerous in Tafilelt—dromedaries, asses, mules, and excellent horses, remarkable for their fine legs and small hoofs. There is also a particular breed of sheep with long wool, the meat of which is of very good flavour. The goats are similar in form and hair to the gazelles. Pigeons and fowls are numerous, and some guinea-fowls are also seen. A little bird, about the size of a sparrow, grey with blue head and breast, seems to be almost confined to Tizimi and Tafilelt. The wild animals are the gazelle, jackal, hyæna, and wild sheep. Hares, rabbits, and partridges are the common game. A troublesome fly which appears in warm weather, and vipers, scorpions, and a venomous spider are the indigenous pests.—*Bull. de la Soc. de Géogr.*, 2e Trim., 1894.

The Frontier of Darfur.—M. de la Kéthulle has returned to Europe after a sojourn of four years in the almost unknown districts of the Niam-Niam country. He pushed north-westwards to the station founded by M. Georges Le Marinel at Bakuma in the country of the Banda, and then penetrated into the territory of the tribe of Ḳreishe on the north, hitherto unknown, where he founded a post on the Kpakpe, the upper course of the Shinko river, in about 7° 20′ N. lat. Then, quitting the basin of the Congo, he explored the source of the Ada, a tributary of the Bahr-el-Arab, founded a post on its banks in lat. 8° 40′, and sent a company of soldiers still farther north to a place called Hofrah-en-Nahas (City of Copper), celebrated in the country for its mines.

Here the explorer was at a distance of 400 miles in a straight line from Jabbir on the Welle, in a country never previously visited by a European (Potagos and Purdy appear to have reached it). He was on the boundary laid down by the Anglo-Congolese treaty of May 12, subsequently abandoned; a little to the north was the frontier of Darfur, and on the west the watershed of the basin of Lake Tsad and the sources of the eastern affluents of the Shari. The region traversed by Lieut. de la Kéthulle is a splendid country and thickly peopled. The watershed between the Congo and Nile, where he crossed it, is formed by well-marked elevations. The traveller explored the sources of the Koto and Ada, which rise at no great distance from one another, in lat. 7° 30′ N. A little to the south rises the Bali, which enters the Mbomu below Bengasso.—*Mouvement Géogr.*, No. 25, 1894.

AUSTRALASIA.

New Zealand.—The *Report of the Department of Lands and Survey*, 1893-94, contains several interesting narratives of explorations. In one of these Mr. A. P. Harper describes the Franz Josef glacier, flowing between the Kaiser Fritz and Baird ranges at the head of the Waiho river, on the western side of Middle island. Its surroundings are in many respects unique, exhibiting a combination of ice and subtropical vegetation not easily forgotten. Alpine plants—as, for instance, the

edelweiss—are seen among the vegetation of the low country. Another new experience is to bathe in a spring at a temperature of 130° F., which, if too hot, may be cooled down by letting in some ice-water from the adjacent river. The glacier descends from a height of 9620 feet to 692 feet in a distance of 8½ miles, and its surface is, consequently, much broken. The rotten state, also, of the ice at such a low elevation and near the sea rendered the ascent extremely difficult, The changes due to melting near the terminal face are enormous; between November 1st and the end of January the level of the top of the ice at the face fell about 70 feet, and the face retreated about 2 chains. On the whole, however, the glacier does not seem to be retreating to any great extent, marks on the rocks indicating that the advance in winter is equally great. Two lines of rods fixed across the ice gave velocities which were astonishing, the middle of the glacier just below a great fall moving as much as 200 inches in the day. This fall has few equals in Switzerland or New Zealand. Mr. Harper's account is accompanied by maps and several fine illustrations.

Another interesting paper, by Mr. S. Percy Smith, deals with the present state of the country around Tarawera, the eruption of which in 1886 caused the destruction of the famous Pink and White Terraces (see *S.G.M.*, vol. ii. p. 568). Before the eruption Rotomahana lake covered a space of about 185 acres. Not only was this lake blown up, but in its place a deep chasm was formed, the little pool at the bottom of which, in August 1886, was only 565 feet above sea-level, all the ground above up to 1010 feet, the supposed height of the former lake, having been blown away. The extension of the present lake towards the north-east is quite new. Before the eruption there was a valley here, but no water. Soon after the catastrophe a lake was formed along the great chasm due to the outburst, which was called Rotomakariri, the name of a small lake to the west, which also disappeared in the convulsion. At the time of the survey in 1886 the surface of this new lake was 983 feet above the sea, or 80 feet below the original Rotomahana. Since then the two lakes have been merged into one, and their surface, which in 1886 was only 25 acres, is now about 5000 acres, while the level of their water has risen to 985 feet. The sites of the terraces are included within the bounds of the new lake. At present the lake is enclosed by steep hills, which formed the crater in June 1886. It is an interesting question what may be the future of the lake. It will have to rise 95 feet more before it can find an outlet for its surplus waters. Should it attain this level, it will overflow into Lake Tarawera, and the water will in a few days clear a channel through the loose ejectamenta filling the Kaiwaka valley down to the level of Lake Tarawera, and thus a considerable part of the present Rotomohana will be drained off. Whether the loss by evaporation will prevent this occurring remains to be seen.

A view of the lake and a chart, showing the changes that have taken place, accompany the article.

ARCTIC REGIONS.

Herr Payer's Arctic Expedition.—Dr. Emil Tietze, Corr. Member of the Society, has forwarded some newspaper cuttings containing Herr Julius Payer's project for an artistic exploration of the North Polar regions. Herr Payer has already obtained some success by his pictures of Arctic subjects, but during their execution he felt the inadequacy of his attempts to reproduce the varied effects of northern scenery, and became convinced that they could only be portrayed by an artist on the spot. He complains that the prevalent idea of those regions is that they present a snow-covered plain overshadowed by a grey, monotonous sky, and that the pictures by artists who have never been within the Arctic circle have contributed

to strengthen this idea in the popular mind. Even his own pictures, painted when the marvellous scenes he had once admired had partially faded from his memory—scenes, too, examined without the analytical eye of the trained artist—lend only too much support to the popular notion.

But, after four and a half years spent in the Arctic regions, Herr Payer emphatically denies that monotony is characteristic of the landscape. In the twilight of spring, and still more of autumn, without gleams, almost without shadow, there is an indescribable charm in the dreamy white outlines, the clear green sky, and the silvery tones of the mountains. The snow is melted, and the blue sea of ice is exposed, only slightly tinged with red by the last rays of the sun, and illumined by the faint glimmer of the stars, while even during the long winter the moon turns the channels among the ice into streams of liquid silver. Then there are the beautiful colours and blending of light and shade called forth by the sun, especially at its rising and setting; and, besides all these ordinary physical phenomena, appearances more wondrous still are caused by refraction. Insignificant mounds of ice are transformed into columns shooting high into the air, and ships below the horizon are seen repeated three or four times, both upright and inverted. The sun is frequently seen before it rises, and mock suns, sometimes to the number of four, encircle it.

It is a common notion that the land in Polar regions is never free from snow. But, however low the mean yearly temperature may be, as soon as the summer heat rises above freezing-point the carpet of snow disappears. In April the rocks lose their covering, in May the flats are bare, and in June extensive meadows yield forage for herds of reindeer and musk oxen. Flowers are so numerous that in some spots the ground is yellow with poppies, ranunculus, and dandelions, bright carmine with *Silene* and *Saxifraga oppositifolia*, blue with forget-me-nots, or white with *Cerastium*. When the sun ceases to set, the melting of the snow proceeds at an extraordinarily rapid rate, the flats are converted into moors, swarms of mosquitos appear in the evenings, and brooks and rivers flood the low-lying lands with the waters from the winter snows.

Especially beautiful is East Greenland; the immense Kaiser Franz Joseph fiord surpasses Norway, presenting, with the green-tinted land on its shores surmounted by rocky walls 6000 feet high, and its mountains 13,000 feet high in the background, one of the grandest spectacles in the world. North-east Greenland is an Arctic alpine land, totally different both from West Greenland and South Greenland, which lie buried beneath the ice-cap. Gneiss and horizontally stratified Silurian rocks prevail in the interior, overlaid by later formations; and basalt forms the islands off the coast.

This, then, is the most promising country for an expedition fitted out for artistic purposes, for the littoral is the most picturesque of any Arctic land, and thence an advance may be made into higher latitudes, where the contrasts and effects become yet more striking. As, moreover, the farthest point reached in this direction lies in about 77° N. lat., the threshold of the unknown might here be overstepped and geographical discoveries made. Herr Payer proposes to have a steamer built of 400 tons burden, with engines of 200 horse-power, and man it with Dalmatian sailors commanded by three efficient naval officers, and to take with him artisans, specimen-preparers, and alpine sportsmen. For the main object of the expedition he would have two landscape-painters, an animal-painter, and a photographer, some of them Austrians and others Hungarians. A movable studio would be fitted up on deck, and at the winter quarters a head studio would be erected on shore, and several small glass observatories fixed at various outlying points, all heated and connected by telephone with the ship. By these

means the difficulty of keeping the colours liquid would be obviated. On sledge expeditions coloured chalks might be resorted to. The officers would carry out meteorological and magnetical observations, and a naturalist, who should be also the doctor, would spend his time in making collections in all the provinces of natural science.

Cape Franklin, at the entrance of the Franz Joseph fiord, Herr Payer recommends for the first winter station. It consists of a mass of rock 6000 feet high, surrounded by miles of grass-covered uplands, where reindeer roam in herds of fifty or a hundred. From this base the fiord could be explored on a steam-launch in summer, and with sledges, snow-shoes, or even bicycles, in winter. Mount Petermann, over 11,000 feet high, might also be ascended, for such heights are an excellent vantage-ground from which to observe the configuration of the country.

To reach the coast of East Greenland a broad belt of pack-ice has to be crossed, and this can be most easily done at about 74° N. lat., where Clavering crossed it in 1823, and Koldewey in 1890. But the task demands bold and successful Polar explorers, and with respect to the choice of men Herr Payer makes some amusing remarks. Newly married men are, he says, too impatient, while, on the other hand, men deeply involved in debt are in no hurry to return to their country. Inhabitants of southern lands, accustomed to warm themselves in the sun, he prefers to those of northern climates, citing the fact that on Napoleon's retreat from Moscow the Italian army showed most endurance.

The cost of the expedition, which is to set out in June 1896, is already partly covered. The expenses of the journey itself, of the artistic equipment, and of the working up of the materials brought back, will swallow up no small sum.

MISCELLANEOUS.

The railway to **Rotorua**, the centre of the hot-springs district in New Zealand, has been opened for traffic.

M. Courtellement related to the Paris Geographical Society, in December last, the incidents of his adventurous journey, in the character of a Musulman Hajji, to **Mecca**.—*Comptes Rendus*, Nos. 18 and 19, 1894.

Mr. Sharpe and Captain Manning have ascended the highest peak of **Mt. Milanji**, and ascertained its altitude to be 9680 feet. As far as is known at present, this is the loftiest elevation of British Central Africa.—*South Africa*, Jan. 5th.

The Archduke Ludwig Salvator, known to members of this society as the author of a magnificent work on the Lipari Islands, has visited the **Columbretes** Islands, lying to the NE. of Valencia, for the purpose of studying their fauna and flora.—*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxvii. No. 10.

The Tricentenary of the discovery of the **sea route to India** by Vasco da Gama is to be celebrated at Lisbon in 1897. The departure of Vasco da Gama will be represented on the Tagus; an international naval, colonial, and fishery exhibition will be held; and scientific congresses, historical spectacles, etc., will be organised. —*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxvii. No. 10.

M. Yachefski has made experiments in the mountains of Southern Siberia on the variations of the **temperature of the soil** in relation to the depth. He has found that the changes are more rapid on the summits and slopes of the mountains than in the valleys, and also that the surface of the ground is colder in the valleys than on the adjacent mountains. No explanation has been found for these phenomena.—*Comptes Rendus* of the Paris Géogr. Soc., Nos. 18 and 19, 1894.

Professor Schröder, of Zürich, who with other naturalists has investigated the animal and vegetable life of the **Lake of Constance**, has found that the great majority of the living organisms are confined to the upper layer of water, extending to about 100 feet from the surface, because the turbid water of a mountain lake excludes the vivifying rays of the sun. At greater depths only very low forms, sightless and colourless, are found.—*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxvii. No. 10.

Mr. Jacques W. Redway discusses in the *National Geographic Magazine*, December 1894, the first **landfall of Columbus**. He shows, from a comparison of old maps, that for a hundred years or more Samana was another name for Guanahani, and then proceeds to argue that the Samana of these old maps is the island now so named. He does not claim to have removed all doubt on the subject, but to have collected material evidence regarding it, and he believes that much may still be learned by the study of early maps.

On January 21st an agreement was signed at Paris defining the boundary between **Sierra Leone** and the French territory on the north and east. France obtains possession of the Upper Niger basin, keeps the post of Herimakuno, and retains the route through Wallia, Wulia, and Lusenia, connecting the French posts on the coast with those of the interior and Futa Jallon. Great Britain also recognises the Franco-Liberian treaty regulating the northern and western frontiers of the Liberian Republic. For the present, British goods will be admitted into French territory on the same terms as those of French origin.

In vol. viii. p. 446, the formation of an island by volcanic agency was reported as having taken place in the **Caspian Sea**. Last summer another submarine **crater** was discovered in the southern part of the sea by the Russian despatch-boat *Lotzman*. It lies in lat. 38° 13′ 30″ N. and long. 52° 37′ E., at a distance of 28 miles from the nearest point of the coast. The diameter of the submarine crater is barely 20 feet, and the sides of the cone slope so gently that the water is only 50 feet deep at a distance of 125 feet from the summit. Farther off, at a distance of about a mile, the depth becomes very great.—*Comptes Rendus* of the Paris Géog. Soc., Nos. 18 and 19, 1894.

M. Eugene Dubois claims to have discovered remains of the "**Missing Link**" near Trinil in Java. In September 1891 was found in some andesite tuff a molar tooth, and a month later the top of a skull; while in August 1892 the upper part of a femur was unearthed. These bones M. Dubois considers must have belonged to a mammal capable of walking upright and possessed of more intelligence than the monkey, such as E. Haeckel supposed to have existed, and to which he gave the name of *Pithecanthropus*. Sir William Turner, however, in discussing these bones last month before the Royal Society of Edinburgh, maintained that there was no proof that they all belonged to the same creature, and that they might very well be human.

The question of the organic origin of **Eozoön** seems to be finally settled by Professor Johnston-Lavis and Dr. J. W. Gregory, in a paper entitled "Eozoönal Structure of the Ejected Blocks of Monte Somma," published in *The Scientific Transactions of the Royal Dublin Society*. The former author has collected a large series of specimens exhibiting the true eozoönal structure, as well as many modifications of it; and their examination shows that the structure is due to the injection of an igneous magma through limestone. The silica, and possibly a little alumina, iron, etc., has been removed from the igneous rock by the limestone, and

the magma is rendered more basic, both by the loss of silica and by the introduction of lime and, possibly, magnesia. In the injected rock is found every gradation from the normal igneous magma to an association of minerals representing gradually increasing quantities of lime, magnesia and, sometimes, iron.

We have received from Taiping three pamphlets by Mr. L. Wray, jun., State Geologist of Perak, on *Alluvial Tin Prospecting*, on the *Experimental Culture of Silkworms in Perak*, and on the *Tin Mines and Mining Industries of Perak*. The last-mentioned also contains several papers on subjects interesting to ethnologists, botanists, and other scientists. Among them is the itinerary of a trip to Gunong Bintang, by Mr. G. A. Lefroy, who two years ago climbed the Gunong Kerban, the highest point in the territory (see vol. ix. p. 598). The highest point of the Bintang, at the northern end of the range, is 6038 feet above sea-level. Mr. Lefroy has many corrections to make in the map of the country. The Perak boundary is marked as running along a range almost due north from the Bintang, but this country is occupied by the valley of the Kopong, and the watershed between it and the Rhui runs in a direction north by east to north-north-east. The whole tract from Ulu Selama to North Bintang is fine agricultural country, totally uninhabited. It seems curious to read that the weather on one occasion was so cold, with the thermometer at 57·5° F., that it was impossible to sleep in a tent.

Dr. George M. Dawson, of the Canadian Geological Survey, has kindly sent us a note correcting the geological map of the Dominion published in the January number of the *Magazine*. The error, which relates to the Archæan rocks, has, he says, "undoubtedly occurred in the process of combining the indications given on the general geological map of the southern part of the Dominion, published in 1884, with the map of the northern part of Canada contained in the *Annual Report* for 1886. The name Archæan is employed on this Survey to include the Laurentian and Huronian systems, and, as no separation has been made between these systems in the far north, a single colour was used to denote both (under the name Archæan) in the map last mentioned. In the map of the southern portion of Canada, the Huronian system, in so far as it has been defined, is shown by a different colour from the Laurentian, both, however, being Archæan."

By using the brown colour in the map in the *Magazine*, it was not intended to exclude the Laurentian system from the Archæan, but such would be the impression conveyed to any one unacquainted with the geology of the country, and, therefore, the pink colour should have been marked Huronian in the "Explanation to Colouring," and bracketed with the Laurentian under the name Archæan, or, still better, as Dr. Dawson suggests, the whole should have been coloured pink, and the small areas to the north of the great lakes denoted as Huronian by some special indication. The rocks to the north and south of the line drawn from Great Slave Lake to Hudson's Bay are, he writes, the same—chiefly Laurentian, with some Huronian bands not yet well defined.

NEW BOOKS.

Asiatic Neighbours. By S. S. Thorburn, Bengal Civil Service. With two Maps. Edinburgh and London: William Blackwood and Sons, 1894. Pp. ix + 315.

The *Asiatic Neighbours*, with whose relations in Central Asia this work deals, are England and Russia. As Mr. Thorburn observes, it is a matter of history that

these powers have long been gravitating towards each other. Between them there are now only Afghanistan, imperfectly consolidated and unstable, and a strip of difficult mountainous country occupied by a number of fierce and turbulent tribes. It seems unquestionable that the advance of Russia has not ceased, and that she is only waiting and watching for opportunity of extending her dominion until it is conterminous with the English. Mr. Thorburn holds that England's policy in the past, with reference to this advance of Russia, has been neither consistent nor successful, alternating as it has done from "masterly inactivity" to "mischievous activity." At one time the dread of Russia has led her to engage in costly war which has entailed ruinous expenditure and produced no lasting benefit, at another she has remained quiet and permitted aggression on the part of her rival when protest and resistance were called for. It is high time, he thinks, that England should once for all determine what policy she is to adopt, and intends henceforth to pursue with undeviating consistency, and what is required of her by the existing situation. With this object, the principal questions which she has to consider are the following: Is there a line up to which she should allow Russia to push forward without resorting to war? Assuming there is such a line, what is her wisest policy in regard to the still intervening space—does it require a corresponding move forward on her part, and if so, of what nature, or should she remain within her present frontier, and confine her efforts to the strengthening of the defence? What is her duty in view of her engagements to the present Ruler of Afghanistan? Mr. Thorburn leads up to the answers which he thinks ought to be given to these questions by carefully reviewing in succession the various factors that call for consideration. These are (1) England's position in India, how far she has a hold on the affection of the people, and what elements of weakness and danger there are in her system of administration; (2) the resources of Russia and her power to injure England in the event of war; (3) the Afghans and their country in its four great divisions and their relations to the present ruling Power; (4) the course of events since the rival Powers first distinctly began to occupy antagonistic positions; (5) the independent tribes within our political frontier, the difficulties with them since the annexation of the Punjab, and how they ought now to be treated. Having completed this survey, he analyses and reviews the rival policies of attack and defence, and finally formulates the conclusions which, in view of the past and of the existing state of affairs, he supports and recommends. It is unnecessary to state here what these recommendations are, nor is this the place for discussing their soundness. The problem is one of much complexity, and the inevitable solution is not one which will be found without patient consideration of all the circumstances which he has so lucidly set forth. It is possible now to see that much of England's policy in the past has been mistaken, and yet to hold that those who were responsible for it, but had not the light we now have, are not necessarily to be condemned. Even if it can be maintained that had England observed a neutral policy from the first, she would have been in a stronger position now, financially and otherwise, it does not follow that such a policy can now safely be adopted. As the past cannot be undone, so it is often impossible to evade the obligations which the past has entailed, and by it England may be committed to a certain line of policy from which it is impossible to draw back without aggravating the evils. Mr. Thorburn is clearly right in holding that it is of the utmost importance that England should decide on a definite policy, and his work can be strongly recommended as a comprehensive and helpful presentation of the elements of the problem and a careful survey of the situation for all who wish to form an intelligent opinion on their country's duty in relation to it. Even those who may not agree in the views he advocates will find that there is much of real value, and

worthy of serious consideration, in his remarks on the administration of our own dependency and the danger of disastrous consequences from forcing Western ideas and methods on the people, regardless of inherited character and the existing state of culture. Not less valuable, also, are the comprehensive sketch of the wild tribes in the mountainous country on the north-west frontier of India and the discussion of the proper method of dealing with them.

A History of Egypt from the Earliest Times to the XVIth Dynasty. By W. M. Flinders Petrie, D.C.L. With numerous Illustrations. London: Methuen and Co., 1894. Pp. 262.

Thomas Edwards, Professor of Egyptology in University College, London, and famous digger into the mummy pits and mounds of Egypt, has here given us the first of six volumes of the History of Egypt. Three, for which he is responsible, are to chronicle the thirty Dynasties, and three are to deal successively with Ptolemaic, Roman, and Arabic Egypt. Such a book, reliably recording the latest facts established by scholars, has long been wanted. Unfortunately, Dr. Flinders Petrie has every merit except that of a readable style. Still, this prehistoric and demi-historic volume is indispensable as a book of reference. No student of, or intelligent traveller in, the Nile country can do without it. True, "the first three Dynasties are a blank," but they are here reproduced with beautiful patience and skill from (1) the various copyists and extractors of classical times who worked on the Ptolemaic compilation of Manetho, and from (2) these four monumental lists —the table of kings adored by Sety I. and Ramessu II. in the temple of Abydos; the list of the tomb of Thunury at Sakkara; the Turin papyrus—all of which agree in the order of kings—and the list of the temple of Tahutmes III. at Karnak. This "History" promises to be invaluable.

Lieder und Geschichten der Suaheli. Uebersetzt und eingeleitet von Dr. G. G. Büttner, Lehrer am Seminar für Orientalische Sprachen zu Berlin.

Anthologie aus der Suaheli-Litteratur (Gedichte und Geschichten der Suaheli). Gesammelt und übersetzt von Dr. G. G. Büttner. Berlin: Verlag von Emil Felber, 1894.

Popular ideas are often very erroneous, and this applies with great force to African subjects. It has been imagined that Africa is "a land flowing with mile and honey," that there a rich harvest may be reaped without first sowing. Also, that "niggers" are little better than the beasts that perish (which is very far from the truth). Such an idea is the one that the natives of East Africa possess no literature of their own. The incorrectness of this is proved by the volumes before us.

Over and over again has it happened that a traveller, having gone to Africa for a few months, comes home and writes a book, thinking himself quite able to dogmatise on the habits and customs, the beliefs and non-beliefs of people whose language he knows nothing of, and whom he has viewed as a low, hardly human herd. It is, therefore, quite refreshing to come upon two volumes like Dr. Büttner's, which give to most readers such a startling revelation of the fact that Africans do possess minds, that they have beliefs, and that in many ways they are not greatly behind other Eastern races in theosophical aspirations.

It is almost a truism to say that Africans will not be civilised until an insight is gained into their mental peculiarities. Books like this must be a great aid to travellers and missionaries, and also to politicians, to all of whom we commend

these pages, not as of mere passing interest, but for careful study; for more can be learnt from them than from most of the travellers' tales that follow one another so rapidly in the press.

Dr. Büttner is quite justified in his endeavour to obtain pure specimens of Suaheli literature; he is right in objecting to those which have been read through European spectacles. It is true that Arab influence has to some extent modified or given colour to many native ideas, but the author has also brought before us the unbiassed opinions, feelings, and thoughts of the natives themselves. What depth of thought and strong religious feeling there is running through "Das Lied von der Barmherzigkeit"! There is absolute faith, resignation, and sure hope of a life to come. Most remarkable are the paragraphs 112, 141, 175, 176, 242. The idea of entertaining angels unawares seems set forth in paragraph 230. The position of woman is referred to with striking deference and affection (paragraphs 117-120), and the same tone is found in "Sitten der Sansibarleute."

In reading "Das Lied von der Himmelfahrt Muhammeds" one is almost tempted to wonder if Dante was familiar with it. Paragraphs 5, 42, 83-89 strongly remind one of Bible stories. "Das Lied vom Tode Muhammeds" is very beautiful in parts. The certainty of "der Anfang des Wiedersehens am Tage nach der Auferstehung" (paragraph 75) is noteworthy, and the old, old question, "Wo wird man sich zusammenfinden, sage, wo ist es?" shows that in East Africa men's minds are busy with questions which have puzzled the brains of intellectual giants in Europe.

Who can read without interest, or without learning much of African character, the story of Amur bin Nasur and of his journey to Berlin? It shows keenness and yet unsophisticated observation. The writer of this note can fully appreciate it, as he had the pleasure of seeing the Waganda who came over to London, and of watching the way in which they enjoyed all the strange things they saw, and yet maintained a staid demeanour through all their astonishment, so that those who did not know them must have thought them unmoved.

With regard to Amur bin Nasur's story, Dr. Büttner is perfectly justified in pointing out what special value it has for travellers, for it gives them a model upon which they can found a correct description of Europe for the natives. No one has tried to describe Europe to a native audience without feeling the extreme difficulty of finding the right expressions to use—expressions which can be understood by the native mind, couched in their own idioms, etc.

Of the shorter stories, the following remind one of Bible narratives: "Woher die Schätze in der Erde stammen," "Alibeg Kaschkaschi," and "Werth der Frauen," though they are, perhaps, still more Chaldean in style, and some of the prayers found in the volumes remind one of Babylonian hymns to Ishtar. "Geschichten von Abunawas," "Fräulein Matlai Schems," "Eine Frau für hundert Rinder," "Der Fuchs und das Wiesel," are all familiar in other dress, and are also found, with some variation, in Central Africa and on the White Nile.

Possibly the most original of the stories are those dealing with the origin of things, such as "Geschichte vom Chewa-Fisch," "Der Ursprung der Bananen," "Geschichte vom Delphin," and "Ursache von Ebbe and Fluth." This last short study of Nature is very good; it shows how the people try to comprehend Nature's mysteries. Also how, when they are unable to solve them, they fall back upon the Supreme Being and cry as others, "Gott weiss es am allerbesten."

That the natives possess wit is abundantly clear; at times they are also sarcastic. They are fond of riddles, and their poetry is good and full of rhythm and rhyme.

Dr. Büttner's translation is excellent, and the more praiseworthy that it is by no means easy to translate Suaheli with accuracy into readable German. The

service which our author (he is, alas, beyond the reach of congratulation) has rendered is great, and it will be the reader's fault if the concluding paragraph of his preface is not justified, "Möge dieses Buch recht Vielen einen tiefen Einblick in das Herz unserer Schwarzen gewähren und unsere Hoffnung immer mehr befestigen dass die Arbeit, die wir an ihnen thun, sie zu christianisiren und zu civilisern, nicht ungeeigneten Boden finden wird."

En Amérique. Souvenirs de Voyage et Notes Scientifiques. Par Henry de Varigny. Paris : G. Masson, n.d. Pp. 300.

M. Henry de Varigny is well known for the able way in which he writes popularly on scientific subjects, and *En Amérique* is an excellent specimen of his style. It records the impressions of a journey to the United States which he made in 1893 in order to visit the World's Fair at Chicago. His personal experiences of travelling, however, occupy only a small part of the book, being confined to the voyage to America and back. There is, of course, a chapter on Chicago, and another on the Exposition, on which the author passes a more lenient judgment than most European visitors have done. The remainder of the book is devoted to subjects of more general and abiding interest; in fact, M. de Varigny's principal object seems to have been to inquire into the present condition of scientific pursuits in the States and their results, more especially in their bearing on the history and the future development of the country. The ethnological questions accordingly occupy a prominent place. One chapter summarises the latest views regarding the primitive inhabitants, while another is devoted to their present descendants and their chances of possible future development. The questions of the Negro and the Chinese are dealt with in a liberal spirit, but with regard to the Chinese the author takes, we fear, rather too hopeful a view. His visit to the Niagara affords him an opportunity of describing how the Yankee utilises the forces which Nature has placed at his service. Several chapters are given to a chat about some interesting American animals, most of them destined to disappear before the advance of civilisation and surviving only in Zoological Gardens, or special reserves. But perhaps the most valuable part of his book is contained in the chapters devoted to a description of Scientific Institutions, the new University of Chicago, the Smithsonian Institution, the Division of Entomology and the valuable services it renders to agriculture, and—what should especially interest our readers—the Weather Bureau. Of other subjects, we mention only the Fishing Industries and Pisciculture. But there is much more in the book, and serious readers interested in things American are sure to find something worthy of their perusal. As M. de Varigny's style is very clear, and his French easy, we feel confident that this little volume will be welcomed by many readers also on this side of the Channel.

Élie Reclus. *Le Primitif d'Australie ou les Non-Non et les Oui-Oui. Étude d'Ethnologie Comparée.* E. Dentu, Paris (n.d.) Pp. 391. *Price 3 fr. 50 c.*

After giving a brief account of the physical geography, flora, and fauna of the Australian Continent in a light and facetious manner, the author introduces us to the native Blacks. His sympathies lie very much and very properly with the undeveloped races of mankind, and in the Australian he finds a good deal to admire. They always keep their word, and never tell a lie; they are quick and intelligent enough in many ways, learn the languages and even the handicrafts of the white man with facility and accuracy; the women are extremely deft with their fingers in weaving nets, belts, handbags, and baskets of great fineness and solidity, so much so as to excite the admiration of Europeans; the men too are far

from being maladroit, but take to this sort of work with greater reluctance; though the children are never punished or corrected in any way, they grow up so lively, happy, and cheerful that any one would take a fancy to them. The less agreeable side of their life is related in the chapters on their food, customs, robberies, initiation practices, sorcerers, etc. The points of contact in these respects with other savages or backward people in all parts of the world are constantly brought to the attention of the reader, to prevent his supposing that the Australian is quite a unique specimen of the human race. But though the volume contains much information, some apparently from French sources little known in this country, it is useless for students, as no authorities are given. It is true that very occasionally a traveller's or a missionary's name is mentioned, but never the name of a book, much less of the page. This is a serious defect, for the author introduces so much of his own personal opinions, and writes in such a rollicking vein, that a reader is apt to doubt whether the facts have not been occasionally strained.

Nederlandsch Oost-Indie, beschreven en afgebeeld voor het Nederlandsche Volk door P. A. Van der Lith. Leiden: E. J. Brill, 1894.

The sixteenth number, completing the second part of this work, has now been issued. The earlier numbers were noticed in vol. ix. p. 391. A large portion of the second part is devoted to the administration of the different islands under the supremacy of the Dutch, and the subject is treated fully and with critical acumen. The land system in Java, as established by Sir Stamford Raffles, the improvements that have since been made, and the defects yet to be remedied, are described and discussed with impartiality. The author has the generosity to admire the splendid work of Raffles at Singapore, though the trade of his own country suffered by the establishment of a free port in close proximity to its colonies.

The Moslem peoples of Java, Makassar, and North Sumatra are portrayed, and the life of the heathen tribes—the Bataks, Dyaks, Balinese, etc.—their customs and occupations, are briefly sketched. Even a book of two volumes, each of some 500 pages, is too small to contain an exhaustive account of all the islands of the Dutch East Indies, and their inhabitants; nor indeed is the material available, for there is still abundance of work for the explorer, the ethnologist, the zoologist, and other scientists, especially in the eastern islands of the archipelago. But there is probably no work which on the whole gives such a thorough general history and description of this part of the world. The information has been obtained from the most reliable sources, and the published results of the latest explorations have been consulted.

A full index is promised which, in a book containing so much and such multifarious information, is especially necessary. We would suggest that a vocabulary of the Malay and other native words used in the book should be appended. When first introduced, the meanings of the terms are given, but it will not be easy to refer to them, and many of these terms will probably be new even to those fairly acquainted with the literature of the Dutch East Indies.

À Madagascar. Par Henri-Ph. d'Orléans. Paris: Calmann Lévy, 1895. Pp. 59.

In a small *brochure* of only fifty-nine pages, Prince Henry of Orleans, on the strength of a two months' trip to Madagascar, makes a strong appeal to his countrymen to take possession of the island. He is very nearly able to warrant that coffee plantations to any extent can be successfully cultivated in the higher parts of the island. Petroleum is there; he is not sure about the existence of coal-

fields; but nearly pure iron is to be found in abundance, the copper ore is very rich, and to the best of his belief even now gold to the value of £40,000 is exported monthly. When the goldfields are once properly opened up under French management, the prosperity of Madagascar will be enormous. But it is positively necessary that force should be used, that the roar of quick-firing guns should be heard by the Hovas to make them understand their duty towards France. A force of twelve thousand French troops would meet with no serious opposition from the forty-five thousand indifferently-armed Hovas, who have only twenty thousand breechloaders, apt to burst when fired merely with blank cartridge, and a few thousand flint muskets. He recommends the route by Majunga to Tananarive, and puts down the cost of the expedition at four million pounds sterling. The pamphlet ends with quite a theatrical flourish, which must have sent a thrill through the Prince's veins while he penned it: "*Baïonettes, sortez du fourreau; grondez, canons; sonnez, fanfares et clairons! L'honneur de la France est en jeu.*"

Madagascar—Past, Present, and Future. By Capt. E. W. Dawson. London: John Haddon and Co., 1893. Pp. 98. *Price* 2*s.*

The substance of two lectures delivered before the Balloon Society of Great Britain, this pamphlet treats of "the aggression of the French and the revival of the slave-trade." A former resident in Antananarivo, Captain Dawson desires to see "Madagascar a free and independent country, where all nationalities can work side by side in commercial enterprises." He gives a map showing that Madagascar far exceeds the British Islands in area.

J. T. von Eckhardt. *Von Carthago nach Kairuan. Bilder aus dem Orientalischen Abendlande.* Berlin: Wilhelm Hertz, 1894. Pp. 317.

This can hardly be regarded as a book of travels, and contains marvellously little definite information about the inhabitants of the Regency of Tunis. The authoress in fervid language describes rather the profound impressions made on a romantic temperament by the landscape and external nature of the country during trips to Zaguan, to Kairuan, and to the mountains of Hamada, lying to the south-west of Tunis, where she spent an uneventful year. From an old Algerian Hadji who gave her lessons in Arabic she extracted an account of his pilgrimage to Mecca, which is briefly recorded in one chapter, and what her black servants told her of their past history—they were only about twenty years old—occupies another. The material for all the chapters is slight, though varying in degree, but it is certainly put together with considerable artistic skill.

Walks in London. By Augustus J. C. Hare, Author of *Walks in Rome*, etc. Sixth Edition (Revised). 2 vols. London: George Allen, 1894. Pp. xii. 364; vi. 368. *Price* 12*s.*

The demand for a new edition (the sixth) of Mr. Augustus Hare's *Walks in London* shows how highly the work is esteemed. Both in matter and in style, the book is superior to the ordinary guide-books, and its success is thoroughly deserved. The illustrations also are excellent, being for the most part reproduced from the author's sketches. There is no special map accompanying these volumes, but plenty of good maps are procurable at a moderate price.

The Clyde Sea Area. Part III. *Distribution of Temperature.* By Hugh Robert Mill, D.Sc., F.R.S.E. *Transactions of the Royal Society of Edinburgh.* Vol. xxxviii. Part I. pp. 1-161, plates i-xxxii. *Price* 30*s.*

It is quite impossible in a short notice, or indeed in anything less than a paper of considerable length, to do justice to this admirable memoir, of which the concluding part is just published. The observations on which it is based were made in 1886-88, and consist of 900 temperature soundings, involving at least 6000 readings of thermometers, at about seventy-five stations; while, in addition to these, statistics of ordinary meteorological conditions, especially of air temperatures and of wind, had to be compiled for purposes of comparison. Dr. Mill displays great ingenuity in dealing with this mass of information and in arranging it so as to bring out the relationships between its various constituents in a clear manner. There are many admirably drawn and coloured plates, forming graphic and readily intelligible records of results which cannot easily be expressed except diagrammatically.

At the time when this huge task was undertaken, Dr. Mill hoped that it might be possible from the data collected "to establish theoretical conclusions of a general and far-reaching kind;" but even the attempt to read from the temperature records the actual heat transactions has yielded only approximate, though interesting, results, owing to the lack of information about the specific heat of water of different salinities, and the need for temperature observations extending over a longer period of time, and in even greater numbers, than Dr. Mill was able to record.

But even if Dr. Mill has not been able to realise his ideal, it is not very easy to exaggerate the importance of the work he has actually achieved. It is at once a valuable record and an admirable model for succeeding investigators; and it is a source of regret that Dr. Mill's increasing duties render it improbable that he will be able to devote much more time to the amplification of this work. He has done one of the best pieces of practical geographical work ever accomplished in Scotland. We may congratulate the University of Edinburgh that their first and only Elective Research Fellow has produced such an admirable account of his fellowship. This memoir well deserves the gold medal awarded to it by the Royal Society of Edinburgh, who have done justice to its importance—and their own—by publishing it in so satisfactory a manner.

Die Temperatur fliessender Gewässer Mitteleuropas. Von Dr. Adolf E. Forster, in Wien. *Geographische Abhandlungen*, herausgegeben von Prof. Dr. Albrecht Penck in Wien. Band v. Heft 4. Wien: Ed. Hölzel, 1894. Pp. 96.

Dr. Forster has collected all the observations he could obtain of the temperature of running water in Europe from the Thames and the Loire in the west to the Vistula and the Danube in the east; and he discusses these in a very thorough manner in the above-mentioned paper. Most properties of flowing water vary directly or inversely with the changes of its temperature. An increase of temperature of 1° between 10° C. and 20° C. raises the speed by 0·5 per cent.; the power of dissolving soluble materials increases with a rise of temperature, and so does the number of micro-organisms. When the river water is at, or very near, the freezing point, the arrival of drift ice may be expected.

The number of stations where river temperatures are regularly observed is very small, and there is great need, not only of increasing these, but also of making the observations on a more systematic plan. A thermometer, made sluggish by coating the bulb with wax, should, before being read, be immersed for a considerable time in the water, which must be in the shade; and the spot chosen should be above, and never below, a town, and near some meteorological station where

regular records are kept of all atmospheric phenomena. The height and transparency of the water and other phenomena, such as the appearance of drift or ground ice, should be noted. As the mean daily temperature occurs at 11 A.M., this is the proper hour for making an observation, if only one can be taken every day. The times of the daily maximum and minimum temperatures—7 A.M. in summer, 8 A.M. in winter, and from 3 to 4 P.M.—are those to be chosen if two readings are possible; and if a third is practicable, then it should be an 11 o'clock observation. A series of hourly records of some self-registering instrument is greatly needed, and should not be impossible to obtain.

July is the month of maximum temperature for most rivers, but sometimes the water is warmest in August, or more rarely in June; while the minimum usually occurs in January.

It is interesting to compare the curves of air and water temperatures. The daily maximum and minimum of the air are practically an hour earlier than those of the water. The annual curves, however, show different relationships, depending on the origin of the stream, the distance of the observation-station from the source, and the nature of the ground through which the river flows. Seven instructive curves are published at the end of Dr. Forster's paper. The first shows how the water of the Sill, which flows from a glacier, has a range of temperature markedly less (about half) than that of the air; whereas the Marne, flowing through plains, has a slightly greater range than the air near Paris, and is always warmer than it; and this excess of water temperature over that of the air is characteristic of the Oder at Breslau, where the range of water temperature is practically the same as that of the air. The Memminger, flowing from a spring near Ach, and also the mountain stream, the Kosavabach, near Sarajevo, like the glacier-formed Sill, have a small temperature range, and both maximum and minimum are less extreme than those of the air. The range in the case of the Rhone at Geneva, and of the surface waters of the Neuchâtel lake, is also less than that of the air, but the maximum in both cases coincides, or slightly exceeds, the highest mean air temperature.

It is to be expected, of course, that as the air temperature has a greater range as we penetrate farther and farther from the coast into the interior, so with the water.

Variations in the amounts of the sun's heat reaching the earth are the main cause of temperature changes in water, as in air. Rainfall lowers this temperature, and clouds also, but in some cases the clouds may act as a protection and prevent chilling. The influence of the great heat capacity of water in preserving a more equable temperature therein than the air can is demonstrable for standing but not for flowing water; while the contact of the water with the ground, the friction set up, and the conductivity of the water, are all factors of minor importance. Neither do the particles in suspension contribute to any appreciable extent in warming the water by entrapping the heat rays. Evaporation has a notable influence, but it is so bound up with variations in the temperature and humidity of the air that the effects of its influence cannot be isolated. The gases in the water also affect its temperature.

Most rivers have far too long a course through regions of differing climates to allow of any exact value being assigned to any one factor; and the position on the river's course of any station must constantly be borne in mind when studying the results obtained. The length of a river's course, its direction of flow, and the gradient of its fall, are all important factors in the problem. Attempts have been made to measure the difference of temperature at the top and bottom of a waterfall, which theoretically should be 1° C. for 428 mètres, were nothing else considered. But the great surface exposed to the air certainly affects this figure, raising the tem-

perature when the air is warm, and lowering it when it is cold. Here again more observations are needed.

Dr. Forster's memoir is an admirable presentation and review of the results already accomplished.

Meteorology: Practical and Applied. By JOHN WILLIAM MOORE, B.A., M.D., etc. London: Rebman, 1894. Pp. xxi + 445. *Price* 8*s.*

To the intelligent medical man the times and seasons are of great importance, and it is fitting that the first volume of a Sanitary Science Series should be on Practical and Applied Meteorology. For many years Dr. J. W. Moore, of Dublin, has been one of that devoted band who undertake the honorary and somewhat onerous duties of a meteorological station of the second order. Consequently, in addition to much enthusiasm for his subject, he possesses considerable practical knowledge of it, and, further, has systematically studied the relation of weather and disease. His treatise on his favourite study is, however, a compilation of somewhat unequal merit, usually good in matters of practical experience, but often inadequate in its scientific discussions.

The chapters on Meteorological Instruments are fuller than in other English meteorological text-books, but the additional matter is more descriptive of the apparatus itself than of the principles and theories involved in its construction. These chapters are illustrated by many figures borrowed from the catalogues of English scientific instrument-makers, but they are not always chosen with discrimination. For instance, the vessel containing water to moisten the wet bulb is shown immediately *underneath* the thermometer, the worst possible position in which to place it. Dr. Moore refers to Professor Cleveland Abbé's *Treatise on Meteorological Apparatus and Methods* in an appendix of the "more important publications of the United States Meteorological Service;" and we think that had he again consulted this excellent work, he would have modified his text, and in some particulars considerably amended it.

The scientific explanations are not always happily, nor always even accurately, expressed. Indeed, Dr. Moore seems to realise that a clear and precise employment of terms is not his strong point, as he is prone, on very little provocation, to quote the physical and other definitions from elementary books on Meteorology, which are not always expressed in unimpeachable phraseology.

Foreign meteorological work is all but ignored, and throughout, while presenting a fairly full account of English instruments and practices, the book is defective as a true account of modern meteorology, and in some parts is out of date.

The closing chapters on the relations between meteorology and public health are much better. Here Dr. Moore is at home, and gives much valuable information.

Die Erhaltung der Mansfelder Seen. Vorschläge eines Meteorologen zur Selbsthülfe. Von WILHELM KREBS. Leipzig: Gustav Uhl, 1894. *Price* 75 *pf.*

The remarkable and rapid fall of the Salt Lake at Mansfeld and Dr. Ule's observations were noticed in vol. ix. p. 88. In this pamphlet the author gives a full account of the later changes in the lake, and discusses the causes of the disappearance of the water and the means whereby a supply may be obtained for the inhabitants of the neighbourhood. He also sets forth the observations necessary to determine whether the water has been cut off from the lake by subsidences, or has been drawn off from the lake itself in larger quantities. He also gives details of attempts to measure evaporation by wet and dry bulb thermometers, which seemed to indicate that the method would be successful, if fully carried out.

Definitions of Geographical Names. With Instructions for their Correct Pronunciation. For Teachers and Pupils of the various Grades of Schools in the United States. A Supplement to every School Geography. By Dr. Konrad Ganzenmüller. New York, 1894. 32 pp. 8vo. 80 *cents.*

This is a very meritorious little work, the object of which deserves the attention of every teacher of Geography. Long ago the better class of text-books on Geography gave some prominence to the meaning and origin of the more notable place-names. That a supplement like this should be called for is apparently an indication that such an element is wanting in the books favoured by American schools. If so, this should prove a valuable little handbook for every teacher. The price charged for so small a work would, however, prevent any sale in this country.

We cannot be quite sure of the Assyrian and Phœnician derivations of the names *Asia* and *Europe*, but the many others are explained with the greatest accuracy, and would be found interesting to any learner. They are arranged by countries, and this affords opportunities of giving short, but very clear, instructions as to pronunciation—a matter of great importance.

Dr. Ganzenmüller's pamphlet, it will be understood, is intended to excite an interest in Geography through the meanings of the names of places, and this would naturally lead on to the utilising of the materials so admirably brought together by Dr. J. J. Egli in his *Nomina Geographica*, where teachers will find abundant examples of the kind so well popularised in this small American work.

Chambers' Concise Gazetteer of the World. Topographical, Statistical, Historical. London and Edinburgh: W. and R. Chambers, Limited, 1895. Pp. 768. *Price* 6*s.*

The excellence of Messrs. Chambers' Encyclopedia is universally recognised; and after saying that the topographical material collected and used for their last edition has been condensed and revised to form this Gazetteer, it is almost superfluous to speak further of its merits. That it is concise, clear, and accurate, follows as a matter of course, and we have also found it well up to date. For example, Waziristan is given as a British Possession, though it was ceded only last year. We have, however, failed to find a few places, and have not always understood the principle of omission. Buluwayo is not given, though we find Salisbury and Victoria; Amherst is included, and Williamstown is not, though both are college towns. There is a want of uniformity in spelling, a thing hardly perhaps to be prevented under the present indeterminate system of orthography. It is probably best, especially in popular works, to employ the commonest form of a word, even if it be open to objection. Rules for pronouncing difficult words are given, but the selection seems somewhat arbitrary; Beaufort, for example, is taken, and Beauvais is left. But the trifling nature of these criticisms is the best proof of the value of the work, which is in fact so good that we regret all the more to find it published anonymously, without any mention of the contributors and editors to whose labour, knowledge, and research it owes its excellence.

A Short View of Greater Britain: showing the Date of Acquisition of the various British Dependencies, with their Relative Grouping and Geographical Distribution, so as to illustrate the Progressive Colonial Expansion of the Empire. By Arthur Paul, M.A., Lond. London: Swan Sonnenschein and Co., 1895. *Price* 1*s. net.*

The long title sufficiently indicates the contents of this "Short View." It could not well be shorter; for, except a skeleton map of the World, showing the positions

of the British Colonies, it consists only of a diagram occupying one page of folio. On this the centuries are marked at the side, and the periods during which the colonies have been in British hands are indicated by lines of different lengths. A great deal of information is here condensed into a very small space.

Beautiful Britain. The Scenery and the Splendours of the United Kingdom. Views of our Stately Houses. London : The Werner Company of Chicago, 1894.

The first series of these photographs is wholly devoted to "Stately Houses." It is to be hoped that the other "Splendours of the United Kingdom" will find a place in the subsequent issues. The style is similar to that of the *Stoddard Portfolio*, already noticed in these pages, and, when complete, this portfolio will be not only interesting as an artistic production, but useful as a book of reference owing to the notes at the foot of each view.

Aids to Accuracy. Tables of History and Geography for frequent Repetition. Containing also a Memoria Technica for Exports and Imports, and the English Railways in Rhyme. By S. CROFT. London : Thomas Murby, N.D. Pp. 88.

As the above work has reached a fifth edition, there is evidently still a demand for this class of school-books ; and, as long as it is the practice to load the pupil's memory with innumerable names and dates, *Aids to Accuracy* will be useful, and the doggrel rhymes it contains will no doubt facilitate the process.

Is the Earth a Planet? A Study in Physical and Mathematical Geography. By C. ROBERTSON, M.D., M.R.S.G.S. Edinburgh : St. Giles' Printing Company, 1895. Pp. 66.

The object of this pamphlet is to prove that the sun's real size is only its small apparent size (whatever that may precisely mean), and to uphold the Ptolemaic system. The argument is based on such assumptions as that the optical diameter of an illuminated body does not diminish with the distance ; that the sun, even with the aid of refraction, illuminates only half the surface of the earth at the same moment, etc.

Ottica. Del Professore EUGENIO GELCICH, Direttore dell' I.R. Scuola navale in Lussinpiccolo. Milano : Ulrico Hoepli, 1895. Pp. xv + 576.

Professor Gelcich gives in this handy volume an excellent sketch of the principal laws and phenomena of optics, as well as descriptions of telescopes, microscopes, and other instruments. As in the other *Manuali Hoepli* he has written, his explanations are full and clear, and are accompanied by numerous illustrations and diagrams.

We think that a mathematical proof should have been given of the fact that the minimum deviation through a prism occurs when the angles of incidence and emergence are equal. Also, the measurement of the angle of the prism could be demonstrated more clearly by a diagram than by an illustration of a goniometer. The caustic formed by parallel rays might have been exhibited as an epicycloid. In discussing the undulatory and emission theories, Professor Gelcich refers to Grimaldi's experiments on diffraction and interference, but does not mention the experiments of Fizeau and Foucault, proving that light moves with diminished velocity on entering a denser medium, which really gave the deathblow to the emission theory.

NEW MAPS.

EUROPE.

IBERISCHEN HALBINSEL, Die Grundzüge der Bodenplastik der——. Entworfen von Prof. Dr. Theob. Fischer. Massstab 1 : 5,000,000.

Petermann's Mitteilungen, Tafel 17, 1894.

ESPAÑA, Mapa de la Distribucion del Indice cefálico en——. Hecho por D. Federico Oloriz, catedrático de Anatomia de Madrid, con los resultados de 8368 observaciones de varones adultos.

Boletin de la Sociedad Geografica de Madrid, Sept. and Oct. 1894.

ST. PETERSBURG, Geognostic Map of the Government of——. By Iv. Bok. Scale 1 : 840,000, or 20 versts to an inch.

Izvestiya of the Imp. Russ. Geogr. Soc., Tom. xxx. No. 4.

ASIA.

SACHALIN, Die Insel——. Auf Grund russischer Aufnahmen und Erkundigungen bis 1890, gezeichnet von Friedr. Immanuel. Massstab, 1 : 4,000,000.

Petermann's Mitteilungen, Tafel 5, 1894.

SIAMESE MALAY STATES, Map of the Telubin and Patani Valleys. From surveys made by Henry Louis, A.R.S.M., F.G.S., etc., 1891. Scale 1 : 316,800, or five miles to one inch. *The Geographical Journal*, September 1894.

L'INDO-CHINE, Carte de——. Dressée sous les Auspices des Ministres des Affaires Étrangères et des Colonies, par MM. les Capitaines Cupet, Friquegnon et De Malglaive, Membres de la Mission Pavia. Échelle de 1 : 2,000,000. 1895.

Annales de Géographie, October 15th, 1894.

LIWA HALEB (Aleppo), Karte des——, und eines Theiles des Liwa Dschebel Bereket nach den Reisewegen Martin Hartmann's in den Jahren, 1882, 1883, and 1884. Massstab 1 : 220,000.

Zeitschrift der Gesellschaft für Erdkunde zu Berlin, No. 2, 1894.

AFRICA.

CONGO FRANCAIS, Atlas des Côtes de——, en vingt-deux feuilles. Échelle de 1 : 80,000. Paris, 1893.

Sous-Secrétariat d'État des Colonies. Service Géographique.

KONGO-GEBIETES, Geognostiche Übersicht des südlichen Teiles des——. Von Dr. J. Cornet. Massstab 1 : 2,000,000.

Petermann's Mitteilungen, Tafel 10, 1894.

WEBI AND DJUBA-GEBIET, Das obere——. Neueste italienische Forschungen in den Galla-Somal-Grenzländern. Auf Grund der vorläufigen Daten gezeichnet von G. E. Fritzsche. Massstab 1 : 4,000,000.

Petermann's Mitteilungen, Tafel 9, 1894.

AMERICA.

UNITED STATES, Geological Survey of the——. J. W. Powell, Director.

General Maps, Scale 1 : 62,500.

ILLINOIS: Dunlap, Metamora.

KANSAS: Sitka.

LOUISIANA: Bayou de Large, Chandeleur, Dime, Dulac, Lake Felicity, Timbalier.

MAINE: Boothbay, Gray, Norridgewock.

NEW HAMPSHIRE—MAINE: Gorham.

NEW YORK: Durham, Elizabethtown (Editions of Jan. and July 1894), Kaaterskill, Niagara Falls, Wilson.

NEW YORK—VERMONT: Port Henry.

NORTH DAKOTA: Fullerton, Oakes.

NORTH DAKOTA—SOUTH DAKOTA: Ellendale, Hecla.

PENNSYLVANIA: Allentown, Bloomsburg, Millersburg, Pittston, Shickshinny, Simbury, Wilkesbarre.

SOUTH DAKOTA: Conde.

VERMONT: Londonderry.

VIRGINIA: Bermuda Hundred, Petersburg, Richmond.

WISCONSIN: Brodhead, Geneva, Janesville, Portage, Silver Lake, Shopiere.

Scale 1 : 125,000.

ARKANSAS: Little Rock.

CALIFORNIA: Big Trees, Lodi, Marysville.

COLORADO: Castle Rock, Pike's Peak.

IDAHO: Bear Valley, Idaho Basin, Nampa, Rocky Bar, Silver City, Squaw Creek.

KANSAS: Beloit, Ellsworth, Mankato, Pratt.

KENTUCKY: London.

MONTANA: Fort Custer, Rosebud, St. Xavier Mission.

NORTH CAROLINA: Statesville, Yadkinville.

SOUTH DAKOTA: Deadwood, Hermosa, Rapid.

TEXAS: Fort Hancock, Fort M'Kavett, Hamilton, Roby, Rock Springs, Salt Basin, Sweetwater.

VIRGINIA—WEST VIRGINIA: Pocahontas.

Scale 1 : 250,000.

OREGON: Ashland.

CALIFORNIA: Banner Hill, Sc. 1 : 14,400. Genesee, Sc. 1 : 31,680. Taylorsville, Sc. 1 : 31,680.

COLORADO: Aspen Special Map, Sc. 1 : 9,600.

SÜD-CHILE, Routenaufnahmen in den Cordilleren von Lanquihue in——. Von Dr. Hans Steffen und Dr. Paul Stange, 1893. Massstab. 1 : 600,000.
Petermann's Mitteilungen, Tafel 11, 1894.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

BRITISH NEW GUINEA.

By Sir William MacGregor, K.C.M.G., M.D., D.Sc., Administrator of the Possession.

(*Read at Meetings of the Society in Edinburgh, Glasgow, and Aberdeen, in March* 1895.)

Geography.—Several times within the last hundred years the island of New Guinea, or a part of it, was formally or indirectly claimed on behalf of the British Crown before Commodore Erskine, half a score of years ago, officially proclaimed it a protected territory. On the 4th September 1888 the sovereignty of the Queen was formally declared at Port Moresby, and British New Guinea became a Crown Colony.

Of the whole island of New Guinea, which has an area of nearly 300,000 square miles, nearly a third part belongs to this Empire, and that part, with about 3000 square miles in islands at the east end, forms a colony with an area of some 90,000 square miles—larger, therefore, than Great Britain.

On the west side it begins at the 5th, and on the east side at the 8th degree of south latitude; the most southerly land in it is at 11° 39′ 25″ south. It is so broad from east to west that it takes the sun fifty-six minutes to cross it; and when it is already dark in the east end, the sun is still above the horizon in the west end.

Its western part lies opposite to the northern end of the continent of Australia, from which it is distant only four or five score of miles. It is the youngest of all the Australasian family of colonies, but three of the other eight are smaller.

It is a real land of mountain and flood. The mountain masses principally occupy the centre of the mainland portion; but as they advance to the west they become lower, much interrupted, and their southern slopes,

receding towards the north, gradually approach and reach the northern boundary. The central chain is more continuous and even towards the east, where it extends right to the sea. The loftiest part is near the centre, on the great Owen Stanley Range, the highest altitude of which is the mile-long crest of Mount Victoria, which rises to some 13,000 feet above the level of the sea. In the west the mountains are chiefly of sandstone and limestone, in the central part they are of volcanic and schistose formation, and they are of very mixed structure towards the east end. They are all covered by dense forest, and are very rugged and precipitous in character at many places. There is a great rainfall on the central chain, producing many rivers of large size in proportion to the superficial area of country drained. The largest river is the Fly, which opens into the west end of the Gulf of Papua, and by which a journey of little over 600 miles takes one to the British-German boundary, at the very centre of the island. The head-waters of the Fly are collected from Dutch, German, and British territory. The next largest river is the Purari, which opens into the Gulf, forming a delta of some 400 or 500 square miles in area. It has not been followed to the boundary, but it probably passes it and leads into German New Guinea. The rivers next in importance are the Bailala, which opens into the Gulf, and the Tauri and Lakekamu, which enter Freshwater Bay. The Fly is navigable by steam for about 500 miles, the Purari for at least 120, the Bailala for 80, the Tauri for nearly 40, and the Lakekamu for at least 50. The Augabunga River in the central district is an interesting stream as coming from behind the great Mekeo Range, and because its shingle contains plentiful traces of gold. It traverses a rich and populous district, but is navigable by steam only 12 or 15 miles. The next rivers of importance are the Musa, Kumusi, and Mambare on the north-east coast. They seem to be navigable by steam for 40 or 50 miles each. In the far west the Morehead has been ascended by a steam launch for 120 miles; but on that river there is not much good land. There is a considerable quantity of rich alluvial vacant land on the Bailala, Tauri, Lakekamu, Kumusi, and Mambare Rivers. There are also areas of good planting land of some size at many places on smaller streams, and on hill slopes and plateaus. The islands are too small to have any large rivers, but both they and the mainland generally are remarkably well watered. The principal islands are mountainous; but there are a few of them low and of coral formation; all are covered by forest. The great mountains of the islands, the highest of which is 8000 feet, are of schist, but many parts of them are volcanic. The rainfall varies in different districts from 120 inches at the east end to about 50 or 60 in the central district near the coast. There is a cooler season, from June to November, during which the wind is from the south-east; and a warmer season, from December to May, when the wind is from the north-west. There is probably a difference of temperature of some half-dozen degrees Fahrenheit between the cooler and warmer seasons. Most rain falls during the latter period, the greater part of it as thunder-showers. The average temperature for the year at Port Moresby seems to be about 83° Fahrenheit. There is not often near the coast an alternation of temperature exceeding half a score of degrees. But on the high mountains there is crisp frost;

and large icicles were seen on the crest of Mount Victoria among the daisies and heaths growing there. The heat is not very often felt to be oppressive in the shade, but it is too great to let Europeans work steadily in the sun. The only precious metal that has so far been found is gold. This is met with in traces at a great many different places. Two or three score of diggers derive a precarious existence from it. Jade exists in quantity. There are traces of cinnabar; and there is a probability of good coal being found in an accessible position. But the great hope of the country is in agriculture.

Natives.—The natives are estimated to number about 350,000. It is not possible to say at present whether, on the whole, they are increasing or diminishing in numbers. In settled districts there are great numbers of young children. As peace is made between contiguous tribes they plant a great deal more food than was formerly possible, and they can attend better to domestic duties all round. Add to these considerations that the number of people formerly murdered was very great, and that this is now being much reduced, and it becomes impossible not to conclude that the population will increase if we do not destroy the people by the introduction of foreign diseases, and do not interfere with the rearing of families by transporting the adult male population to Australia as plantation labourers. Although the birth-rate is now high in many villages, formerly large families were not common. It was so great a social misdemeanour for a woman to have twins that they were formerly in some places killed by exposure. Recently a native official threatened a countrywoman of his own with the strange menace, that he would give her some native medicine that would cause her to bear triplets. This dreadful threat produced a profound impression, for no woman could carry home at night three children *plus* food and firewood for the family for twenty-four hours.

The natives are as a rule smaller than Europeans. The hill people are more sturdy than the coast people, but the latter are often the taller and longer-limbed. They are smallest in the Louisiade group and neighbouring small islands; but there they are worst fed, the cultivation of the Yela islanders being the rudest of any known set of tribes that live in the colony by agriculture. At the Kiriwina islands there is great abundance of food, and the people are of good physique. On the Gulf of Papua there is abundance of sago, and, although many of the tribes live almost exclusively on this, still quantity seems to make up for variety, for the men are tall and muscular though loose-limbed.

In colour they vary. They are of a very dark brown, which would popularly be called black, in a coast strip extending from the Mai Kussa to the east end of the Gulf. The others, as well inland as on the coast and on the islands, are, as far as they have been seen, all lighter in colour. The greatest difference is noticed among the women; the darker women are tall, scraggy, stiff, lank-limbed, angular, and generally jaded; the lighter women are better proportioned, with rounded, well-turned limbs, and are decidedly shorter, more graceful, more active, and far more lively. Amongst the lighter tribes on the southern coast and in the islands there will be found sometimes as many as five per cent. of people with straight

or wavy hair. They either do not exist among the darker people of the west or are very rare. As a whole the people are cheerful and full of life and activity; but the darker are more sedate, especially the more western tribes, than the lighter people. This could only be expected of the former, as they live in a great low swampy district, with no high land near them from which they can obtain a whiff of mountain air; and they live, as on the Fly estuary, cooped up together in huge houses without screen partitions, in stalls allotted one to each family. They spend the night in common smoke, darkness, and noise. If a husband and wife quarrel—which is common enough—the whole community, perhaps counting scores or several hundreds, are disturbed; if a child cries, every one is roused; if an old man coughs, the neighbours are all disturbed. Need it, then, be wondered at that the darker west-coast man, living in such conditions, does not possess the intellectual activity, the artistic taste, the musical proclivities, the economic energy of the lighter man, who occupies his own house, lives in a purer atmosphere, has greater variety of diet, and possesses a good sailing canoe? In a large part of the Gulf, both near the coast and inland, the men generally occupy club-houses and live apart from the women and children, practically without the family life that is enjoyed by the eastern tribes, where each man occupies his own house with his wife and children. Amongst these latter, the sanctity of the private house is so fully observed that each man can with perfect propriety call his house his castle. Hundreds of times, when they were not sure of the object of a visit from the Administrator, they have retired each man to his own veranda, apparently regarding it as an asylum. The additional security is sometimes added of going inside a circle of palm-leaves laid on the ground, as at Yela island.

The largest house seen is on the Fly estuary. It measures 520 by 30 feet; the smallest are barely large enough to supply sleeping accommodation for two or three people. But in Kiriwina the principal use of the house is usually as a food store. They are of all shapes as of all sizes. Many are built over swamps, some of them over the sea, others in trees, or on the tops of inacessible rocks. The last four or five families of a persecuted tribe have been seen living in tree houses. In some parts of the interior the houses are round and conical; in the western interior they consist of a platform and a roof with quite open ends. In the Fly estuary they are barn-shaped; in the Gulf they are like a coal scuttle; in the Louisiades they resemble an inverted whale-boat on trestles; and they can be seen in the D'Entrecasteaux group with a roof shaped like a Turkish saddle.

Even primitive peoples, like the Papuans, learn great principles by experience. Once a Fijian was struck by lightning and severely injured. Two or three old men discussing the subject assured me that had it not happened that the man was at the time wading through a deep creek, he would have been killed on the spot. It must have taken them many generations to arrive at this empiric conclusion. It probably took the Papuan longer to find out the general principle that he will have greater immunity from certain illnesses, especially the fever that is so common in his country, if he sleeps off the ground. He does not raise mounds of

earth and stone and build on the top of these, as do so many Pacific Islanders; but he builds on wooden piles, and has the floor of his house five or ten feet from the ground. Generally, the wind can blow through below. The floor lets all rubbish through it, and the building thus remains fairly clean. He can have a fire below to drive away mosquitoes; and in dry country they sit and work or cook there, as in the Louisiades. But most houses have a veranda for sitting in. There are a few places, but they are quite exceptional, where people live on a ground floor, with the sides of the house covered in down to the ground; but there they often sleep on shelves or even in hammocks. In housebuilding they are as far behind the Tongan as they are ahead of the Australian aboriginal. European settlers follow the Papuan example, and build their houses on piles. This is, of course, easily possible in a country that is free from hurricanes. I understand that the latest book on tropical hygiene advises the white settler to cement the floor of his house. The Papuan plan is better.

Our part of the island of New Guinea was made a British colony for reasons of State—briefly, to prevent any aggressive foreign nation from settling on the north side of Torres Straits, the only waterway communicating between the north-east and north-west of Australia. The natives were not consulted, for the reason that they could not have understood the transaction, and because there was hardly one man there that could speak for another. Each Papuan represents himself politically, and it is seldom that he can or will claim to possess any more extended representative position. There is only one important exception to this, of which the following will serve as an example. A native woman from a village on a distant island is married to a man on another island; a man goes from a third island to the residence of the woman, and when a good opportunity presents itself he kills her, because, when he was a child, her tribe killed the head of his family. In cases like this a victim may be, and is, held to be a representative of the tribe. In social combination the Papuans are probably among the most primitive of the races of mankind, reminding us of the Veddahs of Ceylon. There are heads of families with some influence, and such are distinguished individuals: and there are families that receive greater consideration than others; but with the sole exception of the Kiriwina group, there is no such thing as a chief, in the Fijian, Tongan, or Samoan sense, in the whole Possession, so far as it is known. It was customary among Europeans to think that the late Koapena of Aroma, on the south coast, was a great chief; when the pinch came it was found that he possessed no authority whatever. But some years before that, Mr. Bevan found that Koapena's influence was not sufficient to cause his luggage to be transported from the beach to his house in the village. He was friendly to white men, and he exploited cleverly his connection with them; but, though considered the most influential man on the coast, he could not arrest one of his own tribe or compel him to carry a portmanteau. When we took possession of the country the people were in the stone age; they had no metal of any kind. There are, doubtless, a great many tribes in the interior to whom iron is still quite unknown.

The people live in tribes or communities, held together by ties of

blood or affinity, by language or by mutual convenience; but each householder maintains his own personal independence, and recognises no native master.

There is no such thing as a village, tribal, or district council of elders. Plots, plans, and common action are concerted by "asides," by much whispering, and sometimes by a few public speeches from some one that wishes to distinguish himself at the expense of the neighbours of the community. There is, indeed, in a Papuan village no one that could summon a council, or compel attendance at it, or that could venture to enforce its decisions. Public speaking is not a common practice; perhaps, to some extent, because they generally all wish to speak at once, vivacious volubility being a marked characteristic of the race.

The process of welding together individuals into a social unit, with an effective and recognised head, is one of the most laborious tasks of the Government. When chiefs are not born, or when they are not produced by the superior qualities of the individual, it is a difficult task to create them.

The policy of the Government in this respect is opportunist. In some communities it is possible to put a man into the position of chief, the idea being to make his functions more directory than those of the policeman, who is mainly guided by existing law. In others a suitable man is appointed village policeman, and he performs the duties of constable, and often, to some extent, those of chief. The chief has to be taught the idea, quite new and foreign to him, that he is not to favour his own friends, not to be dishonestly selfish, and that he has really some authority over others, and a responsibility in regard to their conduct. The village policeman is often a time-expired man from the armed constabulary, or he is a man that has committed some high offence in the eye of our law, but generally in accordance with native ethics, and has undergone a considerable term of prison discipline and training, which very probably ended in his being for some time a prison warder. But the chief is, as a rule, also prepared to perform police work; for a man that is fit to be a chief is always capable of being a policeman, although the man suitable as a policeman may not be adapted for a chieftainship. It is easier to produce serviceable village policemen than it is to train useful chiefs. The probabilities are that the best village policemen will eventually become the chiefs of their own communities, in virtue of the authority they derive from their official position.

It is now by no means uncommon for a tribe to ask that a man may be appointed as their policeman. They seem generally to select the best person for the post. Of course he sometimes abuses his office. A tribe visited for the first time almost invariably turns out armed for immediate conflict, if the men do not run away. At first it was always supposed that the Government meant war; but, most fortunately, the idea now connected with it is that of peace. The armed constables are luckily imbued with this belief.

We can notice only briefly some of the customs and manners of the natives.

Marriage.—In some instances children are betrothed to each other

at birth, or before it, or soon after it. At certain places a youth cannot marry a girl of his own village, or of a certain part of his own village, or from his mother's tribe; generally, he cannot marry a cousin. But outside these restrictions he has great liberty of choice, so long as he is able to make the customary presents to his future father-in-law. These are very often given in instalments. The marriage ceremony is elaborate in some places; ushered in by the previous tattooing of the girl; by the admission of the youth to manhood; by many feasts; and by the giving and receiving of numerous marriage presents, the donors of which do not forget their gifts, as they expect to be similarly favoured by-and-by. In some places the essential part of the ceremony is in principle the same as the barest binding form of marriage under the law of Scotland; the young man goes to the house of his bride, and, in the presence of witnesses, calls the young woman "my wife," and they are henceforth one flesh. The most important consideration is the property which the bridegroom has to give to the father, brother, or uncle of the bride. In certain tribes the son-in-law owes an almost life-long modified servitude to the father-in-law. In the west the exchange of sisters between two young men is more common. If this latter arrangement does not take place the young lady frequently exercises her own rights, and sends for the man of her heart to come to her; she then usually elopes with him. This privilege of the initiative in marriage is a right that the less comely, western, darker woman exercises on her own account, and which is all but denied to the sprightlier, lighter, eastern girl. Where the marriage knot is easily tied it is also lightly undone. A childless wife may often be sent away; an unfaithful one may be killed or returned to her parents; and when young couples become tired of each other, they separate without more ado. Ante-nuptial chastity is of no consequence; but a girl is in some tribes ashamed to bear a child to a man that will not marry her, and the illegitimate children are therefore sometimes made away with in those districts. Marriage is very often entered into before the parties to it are full-grown. A man may have as many wives as he can pay for or feed; and on the principle that division of labour lightens it, the first wife seldom objects to the husband taking others. Probably another reason for polygamy is that the husband and wife do not cohabit, or should not do so, while the wife has a child at the breast. The attitude of the Government towards this is, that while deprecating polygamy, it has not, so far, passed any law prohibiting it. There is no trouble about marriage settlements, even through the plurality of wives. A wife enjoys the usufruct of her husband's estate if she remains single; but she does not inherit his property. Polyandry is rare, but not quite unknown. In some tribes the women are the chief landowners, and the children of the marriage belong to the mother and not to the father; but this is not common.

Burials are made in the ground in the west, frequently in a garden. The grave is covered all round by a high fence, and the arms and implements of the deceased are put on the grave. In the Fly estuary stone adzes of a peculiar shape, and sometimes of large size, are put about the grave,—a custom probably arising from the general western habit of put-

ting the bow and arrow, cocoanuts, nets, etc., over the deceased. The custom of putting arms and implements on the graves is seen more or less in most districts. All tribes believe in the after-life existence of the spirit; it goes to a heaven of the same nature as its present abode, only it is always a finer country. But, heaven and earth being of the same nature, the departed one requires the same weapons and implements as here. Farther east, the dead used to be buried in their houses, or in front of them, or the corpse was put on a platform on the end of the house until advanced in decomposition; or it was done up in mats and propped up against the wall of the house, or suspended from a peg. In the west, they bury in the recumbent position; in the east, the bodies are generally put in the ground or litter quite flat, and sometimes with a yam on each side of the head. If the body is not buried in the house, a roof of some kind is, among most tribes, put over the grave until the body is decomposed and the spirit finally takes its departure after the celebration of certain feasts. In many cases the bones are deposited in caves, or they are put into a clay litter supported on posts. Where the body is kept for the soft parts to separate from the bones, the corpse is either buried or kept above ground till it falls to pieces; the dust is in some places deposited in the fork or hollow of a tree. The skull of a member of the family is often retained in the house by the relations until, after certain feasts and ceremonies, it can be finally put away in the charnel-house of the tribe or family, which may be in a cave or in the forest. The suppression of house and village burial has been one of the serious tasks of the Government, but it has been dealt with very successfully over a large area.

Food.—In the western part of the Possession the staff of life is sago. On the Upper Bamu, to one that pretended to be very hungry and unable to eat sago, the great tribes could offer no other food. The trees receive a certain amount of attention by cleaning and weeding at some places. They are all private property near to villages. The men cut the tree and assist in bringing it home. The women chop up the trunk, and wash out the sago from the fibre. But the instincts of all Papuans are so decidedly agricultural, that, wherever it is possible, they cultivate bananas, sugar-cane, sweet potatoes, yams, and taro; and all cultivate flowers or ornamental plants. On the coral islands, and on many of the others, and over large districts on the mainland, the natives have no sago, but live entirely on the produce of their gardens. The introduced food-stuffs they most readily adopt are those that require least labour and attention,—the pumpkin, the cucumber, and the papaya. Maize is coming into use, as in Kiriwina and in Mekeo. Rice they like, but the labour of growing it will make it objectionable. In one or two districts the pine-apple is grown with much success. The native bread-fruit is of little account. The natives eat mushrooms, figs, mangoes, honey, ants' eggs, caterpillars, snakes, crocodiles, all fish and birds, dogs, pigs, flying fox, and almost everything that can be eaten, except oysters and trepang, which are seldom or never consumed by them. They seldom eat man. I have never heard of them tasting the flesh of a European. I have never seen human flesh eaten by a Papuan, nor observed any certain indication that they had really feasted on

human flesh. Undoubtedly pieces of it have been tasted, both raw and cooked. To eat human flesh more or less hallows the eater, and makes him or her an object of fear; consequently, one desirous of becoming a dreaded necromancer occasionally digs up and eats a part of a putrid corpse. At other times, to gratify hatred, to show contempt, to gain fame and glory, a part of an enemy may be cooked and nibbled. Cannibalism, in my experience, does not go beyond that. The Papuans are spare eaters; they like, in some districts, to have something before going out in the morning, lest they should be bitten by a snake, which would, they believe, be inevitably fatal on an empty stomach. But the meal of the day is that taken in the evening. The Papuan as an armed constable, however, soon learns to look for three meals a day, at each of which he relishes a pannikin of tea. He has no fermented beverage whatever. He knows of none himself, and he is rigidly prohibited by law from being supplied with any. A few tribes between the Fly and Mai Kussa drink the *Piper methysticum* at feasts, and on any occasion of importance. These seldom or never eat lime or betel-nut. Those articles are, however, used on the Upper Fly, and everywhere east of that. It is all they possess in the way of an excitant or stimulant. The Papuan is almost always of spare habit; obesity is extremely rare.

Disposition.—In disposition they are by no means quarrelsome as between individuals; but the normal condition of the tribes was to be on the offensive or defensive with their neighbours. They ran regular blood accounts against each other; and if the parties happened to be nearly equally balanced in strength, the credit balance would be sometimes on one side and sometimes on the other. The favourite method of carrying on war was not in open, ranged battle, but by stealthily waylaying or surprising stray members of the other tribe, more particularly the women and children. Sexual crimes were rare; the practice was to kill, not to violate, women. In these blood accounts they have excellent memories. The duty of carrying out the vendetta is generally left to the nearest relations, but is often exercised by tribesman as against tribesman. The recollection of defeat, of ill-treatment, or injustice lurks long in the dark mind of the Papuan. The natives of the Bamu, who appear to have brought some punishment on themselves, still speak of the visit of Captain Blackwood's tender, the *Prince George*, made some fifty years ago; and it is on that account difficult to communicate with them. On the Fly estuary we failed to establish full confidence where some of those with the Rev. Dr. Macfarlane in the *Ellangowan* were too free with native property. On the Upper Fly we were surprised by a shower of arrows falling amongst us when peacefully engaged in prospecting a shingle-bank for gold. But the natives of that district should not on that account be called treacherous or savage, if we look at all the facts of the case. They were on bad terms with the great Italian explorer D'Albertis, and one day one of his men shot a native, probably in self-defence. D'Albertis, as a careful observer and a truthful man, merits great respect, and therefore implicit belief may be given to his own account of the affair, as related in his book on New Guinea. According to him, he was greatly distressed at the occurrence, and seems to have

exercised his mind in pious meditation over it; but how far he was really serious it would be difficult to say, for he had the victim's head cut off and put it in spirits, believing himself a fore-ordained agent in the transaction; and that head can be seen in a glass jar in the Anthropological Museum at Florence to this day. D'Albertis was a naturalist, and he did not then think that the natives of that district would, in their turn, a few years later, make an attempt on the head of an Administrator of British New Guinea. Who can blame them?

Do not suppose, however, that all our travellers have acted in this way in respect of native property. There is every reason to believe that, for example, Bevan, Forbes, and Cuthbertson never deprived a native of anything whatever. The moral that is to be drawn from the examples mentioned above—many others could be added—is that, generally, where the native is sulky or hostile, there is, unless he has been taken by surprise, some reason for it. They are cheerful and good-natured, and extremely affectionate in their family relations. In most cases they will tell a falsehood with a face as unblushing as a rubber doll, and then one can generally extract the truth afterwards. As a rule they confess frankly their share in any crime, but occasionally they deny it stoutly for a time. The chief of Rigo was imprisoned for theft; he loudly declared his innocence to the magistrate, but freely confessed his offence to the Administrator shortly after. They will, in the natural state, steal almost always when the opportunity offers; but they will promptly and good-naturedly restore the stolen article when discovered and identified, and sometimes give small compensation with it, and at other times ask for some recompense. They can easily be taught not to steal. When a young man is recruited voluntarily for the constabulary, his parents escort him to the boat, the mother with a mat and a few yams and cocoanuts for him; when the boat puts off the old couple burst into tears, and the mother will sometimes hold on to her son as far as she can wade out into the sea alongside the boat; then she returns, sits down and cries till he is out of sight. If a married man joins, his wife will sometimes go along the beach, opposite the boat, wailing; and he may have to jump overboard, swim ashore, and return home. Relations have come long distances to visit prisoners; brothers have begged to be allowed to go with arrested men; and widows sometimes mutilate or drown themselves, or jump from the top of a high cocoanut tree, from grief for their husbands. Family affection is one of the brightest and most lovable traits in the Papuan character. It is even stronger than avarice, which is saying a great deal. To let off a prisoner the Administrator has been offered arms, pigs, ornaments, and even the best wife of the arrested man. Their strong affections are sometimes extended to Europeans; for two officers of the Government, Mr. Lawes and Mr. Gleeson, they went into sincere mourning in their own impressive fashion. The other day we landed the village policeman of Paiwa at his home, after an absence of six weeks. First the women cried for joy, then the men cried, and finally he cried himself. They are not naturally cruel, but the constant exercise of the vendetta led them to talk so constantly of killing, that it used to be said that a stranger could

soon identify the verb "to kill" in their language, as being the word most frequently recurring in the course of conversation. For the first two or three years after the declaration of sovereignty, the Administrator was constantly receiving threats that he would be killed if he went to visit certain tribes. That is now quite extinct, and messages have been sent by hostile tribes that they would kill all others, but not the Administrator.

They have quick mental receptiveness, which readily lends itself to tuition. The children are good scholars, but school is, as we all knew long ago, a purely artificial and quite an unnatural institution; and the little Papuan accordingly prefers the sea-beach, the river, or the forest, to school-work. All the missions have raised the question of compulsory attendance; but it has not been felt that the psychological moment for legislative interference has arrived yet. The missions have also raised the question of confining within reasonable bounds the time now given to feasting and dancing. This would not be quite a new idea to the Papuan, for at times the drum, the national musical instrument, is sacred, and cannot be beaten.

The young men easily learn to handle a boat, and to work with edged tools; but they are often very conservative in their feelings, and wish sometimes to cling to certain of the ways of their fathers. At first the natives of Amoamo declared they did not wish to sell any land to the Government, because their fathers did not do so. They are fond of justifying themselves by saying it is "the fashion of the country." They have a keen and well-balanced sense of justice. In judicial matters they are often wonderfully "absolute." Once a chief was being interrogated by the Administrator as to the share his people had in an attack on another tribe. A second chief who was present, whispered to him, "Answer that you don't know; you were not there yourself." In the majority of cases they give their moral approval to the arrest of a murderer, but their hearts rebel against it, and they will wail and beat their breasts when he is taken away. The brothers of a notorious murderer have openly expressed the view that justice required that he should be executed; but their affection for him would have prevented their doing so in his presence. At first they sometimes tied up criminals and left them for the officers of the Government to find; but now they generally deliver them over formally. The Papuan's conscience often drives him to the bush until the visit of a Government officer is past. They soon become accustomed to the idea that they can sell their arms, "because the Government will keep them all quiet." In some places they have even gone too far in this direction, and have paid for it when inland tribes, unknown to the Government even by name, have come down upon them and attacked them at a disadvantage. The mental characteristic of the Papuan on which the Government generally acts is fear. The native has profound respect for a force he cannot control. Hence, in all probability, comes his high, mysterious regard for the snake and the crocodile. A chief once said to me, "All men are afraid to fight; there is great fear in the land, but great peace." Another said, "People are afraid to do wrong." In the most complimentary speeches made to the Administrator, it is always said, "All men fear him." This is candid.

With ourselves we put the abstention from what is wrong too often to the credit of virtue, when it is really due to the fear of the magistrate and to the fear of public opinion. Strangely enough, this feeling of fear does not prevent the native from maintaining his own rights against the Government. Recently, a native owner did not wish to sell a small island, and to prevent the Government from taking possession of it, he went and made a garden and built a house on it.

So far, only one Papuan has been executed for the murder of another Papuan; and in that one case the victim was a constable. It is, however, no hereditary custom to kill white men, and those cases in which a European is murdered are accordingly treated with greater severity.

Language.—Since the advent of the Government, it has given a good deal of attention to the languages of the people. So far as they are known, there would appear to be a continuous thread running through the whole structure. It may be said here at once, that we possess no old ruins, no building, or other remains of an older or different race; and we know of no language in the Possession that can be said to belong to a different family. But we are only in the first stage of this study. Some six-and-twenty dialect vocabularies have been printed in the Annual Reports, twenty-two of which have been prepared by Government officers. The most complete study has been that of the Motu tongue by the Rev. G. W. Lawes. The number in print may not represent more than a half, or even a third, of the whole. Look at the two dialects of Aroma and Kiwai, for example; one would not at first sight detect much, if any, point of relationship or contact; still it seems fairly clear that certain root and generic words are common to both; "rubi" or "arubi," for example, means "tribe" in the Fly estuary; "rupu" has the same meaning among the tribes behind Aroma, and it is found as far east as Tauwara or Milne Bay as "rabi," and again as "lipu" in the Mekeo range, and as "numu" in the Sogeri district. It is also "rabi" or "ravi" in the Purari delta. In the same way "maura," the Kiwai word for "village," is a generic termination in Cloudy Bay, as "mari" in Isimari, etc. The "Dobu" of the D'Entrecasteaux group is found as far west as Dubumabai on the Aird River: while there is a Sogeri in the interior behind Port Moresby, and a Sogeri, an inland tribe on the Gama River. Sisiamia is the name of a great tribe up the Bamu River, and "sisia" means "dog" at Port Moresby.

The languages of the west coast are connected more closely with those of the east by means of the Maipua dialect; for example, the phrase "I don't know," is at Maipua "ipa peu," composed of the eastern "diba,"—"know," and the western "puái,"—"not." Clearly the relationship among the eastern languages *inter se*, and the relationship to each other of the western languages, is, in each division, much closer than between the east and the west contrasted. The affinity of the languages in the far interior appears to be with the eastern rather than with the western languages. This seems to be true of the Maneao tribes, of those on Mount Knutsford and Mount Musgrave, of those in the Mekeo range, and perhaps also on the Upper Purari. Some of the dialectic peculiarities are noteworthy. For example, in the Mekeo tongue we

have well-marked the "ng" of Fiji, and the "f" of Samoa and Tonga, while between it and the coast comes in the Roro language. The "ng" crops up again in the Dabu tongue west of the Fly, in far-distant Sudest and in Yela or Rossel Island. Great personal liberties are allowed in selecting the consonants to suit one's taste, but this latitude of choice is not confined always to the consonants; for at Mobiabi, a name which itself could be written correctly in about a dozen different ways, the name of the chief is equally well written "Kasari" or "Kosoni." But our dialects are seen not only to overlap and interlace with each other in this way, but to have strong connections with the Pacific and Maori languages. There is a Matupi in the Bismarck Archipelago, and one inland of Karama in the Gulf of Papua. The Bailala River in the Gulf, which, it should be mentioned, is called by the same name by the inland Hakeko tribe, would, with the change of one letter, be good Fijian for "empty water." Wailabanua, at the mouth of the Upugan, is nearly equally good Polynesian. We find the "Oropai" on the Upper Bamu; "Taburi" in the hills of "Koiari" and "Taborogolo," at an altitude of 3000 feet, not far from Mount Obree in the interior, all well-known Polynesian words. It is curious how frequently the Polynesian word "tabu" is met with in names in New Guinea, but apparently only as an appellation, without specific or intrinsic signification. Many of the dialects sound pleasantly, and the Papuans are endowed with soft, remarkably musical voices, where they are not destroyed by a cross bar in the septum of the nose, large enough to act as a nasal obturator. They are always very willing to talk; and they take themselves considerable interest in dialectic differences, and in the writing down and comparing of these. In an assemblage of fifty or a hundred people, it has sometimes been thought that at least five-sixths were all talking at the same time. They carry their rudeness towards each other in this respect so far, that it becomes a trial of who can speak loudest; the man that can do so usually has the last word. On the north-east coast no language north of Collingwood Bay is known to us yet.

General.—In the east the natives, except at Rossel Island and the north-east coast, generally possess sailing canoes, and they can travel in this way farther than can the Gulf and Fly tribes that have no sailing craft. Only the probability of getting killed by strange tribes restricted the voyages of the eastern man. Now that this is removed, travelling is being greatly and fast extended, and a common tongue is becoming necessary. In the central districts this is Motu; in the east and west the tendency is clearly towards English; and this language, with missionary assistance, would soon become widely diffused on the coast.

The chief native industries are making sago, pottery, making and painting cloth, and baskets of mat-work, by the women; canoe-building, wood-carving, the making of ornaments, of nets for fishing and hunting, by the men. Generally only one of these will be found much developed at one place. The natives in the settled districts spend much time in travelling, hunting, fishing, dancing, and feasting. There are often certain men that, like the ξένος of the Greeks, can go from one tribe to another unmolested to visit a particular friend, who receives and entertains them. Like the ancient heralds, these men are seldom molested.

Much has been said about the superstitions of the Papuans. It is not easy to say whether they fear more the Government or a witch. Precisely as among white people, the most ignorant and ugliest creature is the one to whom a knowledge of the supernatural is ascribed. As old Europe held the Finns and Huns to be the necromancers of the day, as the silliest and most benighted old woman in the district is still the witch of the Scotch glen, so the coast Papuan most dreads the incantation of the more ignorant mountain man. The art is inherited, or may be acquired by purchase. It is thoroughly believed in, and is greatly dreaded. Not long ago a young man killed his own mother because he believed that she by witchcraft was making him sick. There, superstition mastered the extremely strong family affection of the Papuan. One of the latest inter-tribal wars arose from the fact that one tribe blamed another for raising the wind to an inconvenient height. But the imprisonment of the sorcerer has much weakened his influence. All fear the spirits of the dead, at least until they are finally sent away with fitting honour and full stomach. The spirit is likened to the wind, but is always provided with teeth and claws.

Social courtesies are somewhat restricted. There seems to be a dearth of friendly greetings. In the central districts the amicable form of salutation is to rub noses. It is wonderful how well this kind of friendly and personal contact relieves the feelings. On the Morehead River they touch the navel as a token of friendship, perhaps to signify that they are as twin or delphic brothers; at Maisina, on the north-east coast, they touch the nose and the navel. On the Fly, on the north-east coast, and on Duau, they have been seen to warmly clasp each other in the arms. But hand-shaking is coming so fast into fashion that men come and offer their hand sometimes at the first visit to a tribe.

A singular way of receiving the strange white man has been noticed among both the darker western people and the lighter eastern folk. At certain places in the west a man was sent out from a village in a small canoe, profusely decorated with shells, feathers, paint, and flowers. When he came near he danced as well as he could in such a position, and gradually approached, dancing now and then, without any music. On the Mambare, on the north-east coast, as soon as they found that we were not warlike, we were generally received by a man who danced vigorously on the river bank until we left them. What this really means is not yet known, but it plainly indicates something peaceful.

The Papuan's ruling passion is avarice. He is too mean to be hospitable, but keen enough to be an excellent trader. His greatest delight is to smoke or eat at the expense of his white visitor, or to sell him something, then steal it and resell it. But they differ greatly. The Toga tribe is separated from the Dabu by a small river; the former are all thieves, the latter will not steal anything. Under tuition and discipline the Papuan soon becomes an honest, truthful, faithful, trustworthy servant. They become much attached to their masters, but every now and then, seized by a desire for home, they will insist on leaving him for a season. They often show wonderful trust and confidence in the white man. Not long ago, two unarmed boys and an

officer of the Government spent the night in a hostile tribe that were bent on murdering the whole party. The two boys never showed the least fear. One of them said next day, that he thought he would be knocked on the head; but that he knew his master would instantly shoot his assailant, and therefore he was not afraid.

ADMINISTRATION.—A sum of £15,000 is annually provided for the current administrative expenses of the Possession. This sum is paid in equal portions by the three colonies of Queensland, New South Wales, and Victoria. In addition to this they pay half the cost of maintenance of the s.s. *Merrie England*, kept for the use of the British New Guinea Government. These colonies are therefore allowed to have much to say to the general direction of the lines of policy by which the government of the colony is directed.

If you look at the map you will see at a glance that Australia is a great land, and in such a position that it is fitted to be permanently a white man's country—that is, a place where white families can be reared and the race can multiply. You will notice that British New Guinea, though it is larger than Great Britain, is so small relatively as to be only a sort of appendix to Australia, and so near to the equator that it is not fit to be conveniently the fixed abode of white women and children. The countries are only a day or two's steaming apart. In these considerations you will find the rational explanation of the fact that the Government of British New Guinea is as closely connected with Australia as with London. Personally, I feel sure that Australia will before long become a federated dominion of the Empire, and that it has before it the future of a great nation, free from the heavy military burdens of the mighty European nations that have the misfortune to be next-door neighbours and to be as suspicious of each other as so many Papuan tribes. It follows that the destiny of British New Guinea is to be a satellite of Australia, and if it is not mismanaged it will be a great and valuable dependency of that commonwealth. The imperative and direct reason for its incorporation into the Empire was to preserve the Australian colonies from immediate foreign neighbours, which could be prevented only in this one way. The three colonies mentioned above are expending their money on it in the hope that they may turn to some good account the country and people we have been considering.

The Government of the Possession is provided with the ordinary power of passing laws to suit its requirements, subject to the sanction of the three Australian colonies and of the Secretary of State in Downing Street. It has courts possessed of all the ordinary jurisdictions; and it has all the requisite departments necessary for an administration on a small scale. In all serious cases an appeal may be made from the courts of the colony to the Supreme Court of Queensland.

There were two main courses open to the Australian colonies. It would have been easy to carry on a selfish policy; to confiscate native lands; to sell them and all waste lands, regardless of the future; to impose burdensome taxation; to obstruct and resist the wishes and plans of the Administration. The voice of the other two colonies is expressed

through Queensland. The Governor of Queensland, who conveys instructions and advice to the Administrator, has to consult his ministers in the first place. The Premier of Queensland thus becomes a potent directing power in respect of British New Guinea. There have been four Premiers of Queensland since the Possession became a Crown colony—Sir Thomas M'Ilwraith, Mr. Morehead, Sir Samuel Griffith, and Mr. Nelson. It should be made well known that with each one of these gentlemen the first point for consideration in every New Guinea question has invariably been the interests of the native race. Without the support of the Premiers, without their hearty co-operation, without their sympathy and encouragement, the Administrator would have found himself almost powerless. The unusual, perhaps unique, arrangements for carrying on the government of the new colony have succeeded in practice remarkably well. They have worked smoothly because, so far, the Colonial Office, the three contributing colonies, and the Government of the Possession have all had the same objects in view—to treat the native race fairly and honourably, to give it every opportunity of rising from its position of barbarism to one of some degree of civilisation, and to prepare the country for the enterprise of Europeans. So far as fair and just treatment of the natives is concerned, it may be said that the best means of securing that was adopted in sending an Administrator, with neither soldier nor policeman, to found and institute a government. Such an administration cannot afford to be unjust, as its basis is moral force. This necessitated carefully considered laws, and required that some local native physical force should be organised. Native lands are preserved to natives by law; the people cannot be supplied with arms, ammunition, or intoxicants; they cannot, with a few exceptions, be removed from the colony except to make voyages as hands to Queensland's northern ports in vessels located in New Guinea. A trustworthy and active force of three to four score armed constables has been established, which practically consists of Papuans. It was begun, after the Government had been at work about two years, round a nucleus of a dozen Solomon Islanders, recruited in Fiji under the kind supervision of Sir John Thurston. These men have now become settlers in the colony. Inter-tribal hostilities, formerly all but universal, have been put an end to over great areas. Vendetta-murder, formerly of daily occurrence, has been stamped out in large regions by the constabulary and by the magistrates.

To repress petty crime, like theft, a system of village or tribal police, who are without arms, is being developed; they already number over fourscore. This is a most useful auxiliary to the constabulary, which has greatly extended native planting operations in many places by putting an end to garden pilfering. Several hundred natives, engaged before the magistrates, are regularly in the service of white employers; and many of them work for short terms so near to their homes that such formal engagement is not necessary. Numbers of them are fishing on pearshell boats in Torres Straits, which is permitted if the boats are located in the Possession. One hundred and two fishing boats are licensed from the western station alone. One hundred and sixty-eight men were engaged before the magistrate in the east end last year. Others are getting

sandal-wood, trepang, and copra for the trader, or washing out gold, or fishing pearls. One of the chief ways in which at this moment the Papuan is laying the foundation of future trade and industry is the planting of cocoanuts. Much fraternal advice has been given to him to plant these trees, as providing a certain and perennial income. But as soon as it was felt to be practicable, a law was passed by which gentle and judicious pressure is brought to bear on the native proprietor in the districts near to the different Government stations. The magistrate for the western division reports that two tribes have put in 10,000 cocoanuts; the Government agent in the Rigo district says the natives have planted 60,000 nuts within a day's ride of the station. It is the cultivation best suited for them, as it requires least care and is well known to them, while the cocoanut is indigenous and flourishes everywhere in the Possession, at least up to an altitude of 3000 feet. But, compared to the whole, a mere fraction of the natives are engaged in these industries. We require capital and skilled European labour to be diverted there, to give employment to the native in his own country, and to show him what can be done by knowledge, skill, and perseverance in industries new to him. Now, why should the European go there with his skill and capital? Because he will there find a fairly healthy tropical country, with good and cheap land, with local labour, and with a climate that is free from hurricanes.

The ordinary diseases of Europe, such as measles, scarlet fever, diphtheria, typhoid fever, hooping-cough, and venereal diseases, are absent. The contagious and deadly forms of tropical dysentery are unknown. The only common, serious disease is the malarial fever of the country, which with care and judicious management is not malignant. It is very uncertain in most aspects: it occurs in what would seem to be healthily situated districts; it is often totally absent in great swampy, low-lying regions, where one would think it should reign supreme. It is not possible to say beforehand whether a given person will be much subject to fever or enjoy an almost total exemption from it. A person may have an attack every few weeks, or only one in a couple of years. Those that are not exposed to the sun, to wet, and to wind seldom suffer much from it. Natives, and even animals, have no immunity from it. In the great majority of cases, if ten grains of quinine and five grains of antifebrin are taken on the first appearance of the uncomfortable feelings that announce the approach of fever, nothing more is heard of it. It does not kill suddenly, so that there is generally time to get away from it if necessary. It is not usually attended with shiverings, and does not often become remittent. Without it we should have no local disease of any consequence. Of course, in such a country, if one has a headache or a touch of dyspepsia, all is put down to fever. In my own opinion, there is no good reason for being afraid of it. When it was less known it was naturally much more formidable than it is now, for the mental microscope always magnifies the unknown. Before long, people will take much less notice of it than they do at present. Prisoners and constables do not die of it. It is not clear that any one in the employment of the Government has succumbed to it alone. But frequent and prolonged attacks of

it would, and do, undoubtedly affect the internal organs deleteriously, and render the whole system more susceptible to other forms of disease, and less able to resist them. Of the other local diseases, such as elephantiasis and leprosy, which are neither common nor severe in type, the European need have no dread. Skin disease is more liable to touch him, but that, in most cases, only means the expenditure of a few pence on sulphur ointment. Once the fear of the unknown has been removed, the colony will, for its latitude, be regarded as a healthy one rather than otherwise. But there is, of course, great danger of deadly diseases being introduced from abroad among the natives, so far quite unused to them. In this respect we can guard ourselves on the south coast, but we cannot prevent our Dutch and German neighbours from introducing disease, as we can neither institute nor control their quarantine.

Now as to the land. There is a certain amount of waste and vacant land of good quality—that is, land that the natives neither require nor use, nor are likely to need at any time. To put natives off their land, to make room even for a grower of sugar-cane, would only be to commence the worst form of racial hostility. That would be political folly, it would be grossly unjust, and it would also be quite illegal in British New Guinea. People have said to me sometimes, "Oh, but surely you are not going to leave all that fine land in the possession of the natives; that would mean that they are to occupy the best part of the country." Happily the Administrator is powerless in that matter. He has no more power to take from the native proprietor the patrimony of his fathers than he has to dispose of Peter's Pence. If the natives occupy the best part of the country, it can only be said that in that case they are the owners of the best part of the country. But there are waste and vacant lands of as good quality as the native-occupied land; and the natives are often able and willing to sell other lands belonging to them. The selling and the leasing of land is not a new idea to Papuans, for they sometimes leased and sold to each other. The Government may buy from natives and may sell to settlers lands so acquired, or lands that are waste or vacant. There is more land already available for settlement by the European than there is any likelihood of being taken up for many years to come.

The policy of the colonies is to sell land to *bonâ fide* cultivators, but not to encourage speculation by selling large areas to exploiting syndicates, or to grant concessions that would be immediately sold for what they might bring. Several pressmen have asked me whether it is true that we wish "to lock up the land." They have been requested to supply the name of any one single man that ever applied for land for *bonâ fide*, actual use, to whom land has been refused. The truth is, that with a not very numerous home population, as great nations go nowadays, we have an enormous tropical estate which presents much to choose from for settlement, so that it is difficult to get the man that means business to go to British New Guinea. But, if he does come, the Government will certainly do its best to find him what he wants. The State cannot afford to survey and lay off lands and offer them for sale. Any person really wishing to grow, say, sugar-cane, tea, coffee, tobacco,

vanilla, cotton, rice, sisal fibre plant, cocoanuts, or any other tropical product, can find land which will suit him, unless he is very difficult to please. The colony possesses nearly every sort of geological formation and nearly every kind of soil; swamp land, alluvial land, hilly land, at elevations from sea-level to an altitude of 13,000 feet. For the cultivator, the minimum price of land under a Crown-grant perpetual title is 2s. 6d. per acre. In this connection it cannot be too forcibly impressed on you that the colony lies just north of the hurricane zones, so that there is no risk of losing one's crop through that ruinous and destructive agency. The sugar-cane, the cocoanut, and apparently some kinds of cotton, appear to be indigenous; tobacco is probably not so, but must have been cultivated for many generations in the country, so that it is practically a native of the colony. Some of the varieties of sugar-cane seem to be very superior, and several that are being tried in Queensland promise good results. Tea and coffee are already growing in the colony on a small scale; and as healthy seeds and plants of the latter, both of the Liberian and Arabian kinds, are now procurable there, it is forbidden to introduce any more, for fear of importing the coffee-leaf disease. Cotton would probably do remarkably well in the dry central district, which has the least rainfall—probably about 50 or 60 inches. The native tobacco has been reported on as of great value, and there is undoubtedly an excellent opening in that industry. So far as safety to person or property is concerned, it may be said without hesitation that the Government is perfectly well able to maintain peace in all the settled districts, or in any place that may be occupied by settlers. The attitude of the natives towards their European neighbours has invariably been friendly. One of the peculiarities of the early settlement of the colony has been the singular absence of all racial conflict.

So far as local labour is concerned, it may be pointed out that a settler may recruit labourers at any place in the colony without any exception. If they are engaged to work at a greater distance from their homes than twenty-five miles, they are engaged before the magistrate. The obtaining of labour is left entirely to the employer, as the Government cannot recruit for him. There is no doubt that considerable numbers of natives would work voluntarily. The Government is very desirous of seeing them provided with industrial employment in their own country, and would certainly put no difficulties in the way of their being legitimately engaged by the settler. For some kinds of enterprise it might be necessary to introduce a nucleus of permanent skilled labour, of Indians or others. There are objections to the introduction of such people into the Australian colonies, where they would compete with the white labourer, and might establish a coloured race in a white man's country; but these considerations do not apply to British New Guinea, which is hardly suitable as a permanent home for the white races; and I see no reason whatever why Indians or any other race should not be used as labourers in the Possession. There is every reason to believe that such people would be healthy in New Guinea, as there is practically only the fever of the country to contend with, and there is no reason to apprehend any serious inconvenience

from that source. There are in the colony now numbers of coloured foreigners, that are well acquainted with it and are generally related by marriage to the natives, who could act as under-overseers, and give much useful assistance in opening plantations. There are also many natives that have been in the constabulary, or in the employment of the Government or of traders and settlers, whose services could be utilised by the planter, especially until the latter gained experience of the country and people for himself. Payments to natives by Europeans have hitherto generally been made in tobacco, hardware, and drapery. On the former there is a duty of 1s. a pound; on the latter, of 10 per cent. *ad valorem*. But there is a decided tendency arising in various places towards regular money payments, which vary from 10s. a month for new hands to two or three times that amount for men that can take charge of boats and trade for a European employer. It should be mentioned that on imported rice there is a duty of 10s. a ton, and that meat and flour are free, and so also are all kinds of machinery and all ordinary building materials. To secure regular connection with the outside world there is a subsidised service, which calls once in two months at convenient places on the mainland, from Samarai in the east end to Daru in the west end. This service touches at Thursday Island and Cooktown. Besides this line, there are numerous irregular means of communicating with Australia. There are good stores for the sale of general articles of merchandise at Port Moresby and Samarai, with small branches at several other places. During the six months of the south-east monsoon the climate is pleasant to one accustomed to the tropics, owing to the fresh south-east breeze that comes sweeping in from the Southern Ocean, often compelling one to use a blanket at night. All things taken together, life there can be made very tolerable, or even agreeable, to a healthy, active, temperate man.

Finally, it may be said that the country would seem to offer a good opening for the man with some capital and a knowledge of tropical agriculture of some kind; but that it presents little field for the ordinary European workman; while it is fully supplied already with the small trader, for buying what the native at present produces.

BEIRA.

By A. Carnegie Ross, H.B.M. Consul at Beira.

The little settlement of Beira—it can hardly be called a town—is the capital of the territory of Manica and Sofala, administered under charter from the Portuguese Government by the Mozambique Company. This territory extends from the Zambesi on the north to the 22nd degree of south latitude. The western boundary, Mashonaland, runs more or less parallel to the coast.

The northern portion, especially that part which lies south of the upper reaches of the Zambesi, has long been fairly well known, and

occupied in a way ; but the centre and southern parts, forming the greater part of the territory of the Company, and now considered to be the most important, have only come into notice within the last four years. The northern part includes Sena, Manica, and Gorongosa, and really forms part of Zambesia, and has always been reached from the Zambesi and governed by officials attached to the Zambesia administration. The central part, however, was little known till 1891. The seat of its government was at Chiloane, and the headquarters of its small trade were there and at Sofala. From these places (which are on the sea-coast and have been long established) native-manned boats were from time to time sent up the Busi and Pungwe rivers and their tributaries, laden with trade goods to be bartered for india-rubber, beeswax, ivory, and gold-dust. At various points on the coast pearls of inferior quality are fished, and at Sofala ancient gold beads and pieces of ornaments are found in the beach sand, but not in quantities sufficient to make it worth while to pay labourers to wash for them. The natives occasionally wash the sand and sell the gold to the storekeepers. The southern part of the country is practically unknown. The territory is thus made up of three distinct parts possessing very different histories. In the northern portion the inhabitants are accustomed to subjection either to Europeans, natives, or half-castes, are frequently involved in petty wars—one headman against another, or all against the Government—and are familiar with trade, well understanding the value of their crops and the advantages of produce or money as means of obtaining goods from the traders ; the people of the centre, living on the banks of the Pungwe or Busi, are timid and divided, are ever exposed to inroads by the people of Gungunhana, and, being in consequence paralysed by fear, show but slight inclination to work; and the southern part is subject to the rule of a native despot.

The first steps towards the opening of the country were taken in 1890, when a survey of the mouths of the two rivers was made, and it was ascertained that there existed a channel of comparatively deep water from the sea up to an ample and sheltered anchorage. A small settlement was built, and in the following year Beira was chosen as the landing-place of the Portuguese troops who formed the Massikessi force and occupied the country. In 1892 the country was taken over from the Portuguese Government by the Mozambique Company.

The general features of the country resemble those of the rest of the east coast of Africa—a low-lying, swampy littoral of about 50 miles, very unhealthy on the whole, but capable of limited occupation at certain points, and, behind, uneven high ground. The low ground is intersected by numerous sluggish rivers with muddy banks, which flow through extensive mangrove swamps. The rivers are much affected by the tides and full of fish, few of which are edible, and are the homes of hippopotami, crocodiles, and fishing birds. The high ground is covered with low, knobby hills, carrying bush, small trees, and dense high grass. The Pungwe river is about two miles broad at its mouth, while 50 miles up, at Fontesvilla, it has narrowed to 100 yards. In the rainy season the banks are covered with water, and the adjoining swamps become vast

lakes measuring many square miles in extent. It is said that canoes have been navigated from the Zambesi to Beira in an unusually wet season, advantage being taken of cross connecting canals. In spite of its strong resemblance to other parts of the province of Mozambique, this country has a distinct character of its own, due to its having been so lately occupied, the paucity of its native population, the absence of local trade and the great importance of the two mining districts in the interior, and the consequent disproportion of the transport industry to actual buying and selling. There was at first much difference of opinion as to the best means of developing the resources of the territory. One party, interested in the coast and the opening-up of the country generally, advocated a survey of the coast-line and a search for other possible harbours, and the establishment of officials at all places likely to be important; the other party, believing that the future of the country depended on its mines, recommended the concentration of all efforts upon Beira and its harbour, and the improvement by every possible means of the line of communication with the Manica goldfields and those of Mashonaland. The policy of the Mozambique Company has been as much as possible to develop the whole country, and has evoked criticism from both parties. Money has been expended in organising a postal service to all parts of the territory, in the upkeep of the establishments of numerous district officials, in the maintenance of about 100 European police, in the surveying and laying-out of large townships where at present there is only bush, and in the clearing of roads. Within the settlement of Beira itself much has been done to improve the conditions of life and to facilitate commerce. The entrance-channel has been well marked out by buoys, a wooden landing-stage has been erected close to the Custom-house, and the latter has been connected with the town by a Decauville tram-line. The streets are lighted by oil-lamps; numerous offices, workshops, and dwelling-houses have been put up by the Company, and rude footpaths of hardened mud have made progression from one part of the town to another much less troublesome. The most important work, that of preventing the encroachment of the sea, was forced upon the Company eighteen months ago. This is now almost completed, and seems to be fairly successful. The result of the two years' work has, many think, shown that, at this stage, the most profitable policy is to develop the means of communication with Mashonaland and the goldfields, and that transport is the business which merits most attention. British capital has done much to improve the means of communication. The rapid development of Mashonaland obliged those interested in that country to have a railway (120 miles long) made to bridge the fly-belt, and also to erect a telegraph wire and clear out roads.

The journey from Beira to the interior is made in stages. The first is to Fontesvilla by steamer, in some four hours. The journey is generally made upwards with the flood and downwards with the ebb-tide. The downward journey is often varied by the vessel going aground and remaining fast for periods of from one hour to one week. Goods are conveyed up in lighters towed by a steamer, and, of course, are liable to similar delays. The lighters used are those employed in discharging

vessels in the port. It has often happened that vessels have arrived in port to find that all the lighters were aground somewhere on the river, and that several days must elapse before any cargo could be discharged. From Fontesvilla the railway runs to Chimoio, a whole day's journey. The first section of the line runs for ten miles without change in level or direction. Along this the little train, on a two-feet-gauge line, runs at a very fair speed. After this the hills and the flies begin to appear. The plain, which is covered as far as the eye can reach with dense grass, is full of buck of all sorts, accompanied by lions and other beasts of prey. At the proper season the shooting is unsurpassed. As a rule, only game meat is consumed at Fontesvilla. The hilly ground is very rough, and the line incessantly goes up and down and round corners, necessitating a slow rate of speed. From the train one sees only little knobby hills, covered with small trees of little value. Water is scarce, and has to be drawn from wells 30 to 40 feet deep. There seem to be very few native villages near any part of the line. At about the 80-mile station, after passing for a couple of miles over heavy embankments and through deep cuttings, the line emerges on to a plateau, and runs with easier gradients and curves to Chimoio. All along the line wood fuel is used, but it is only between the seventieth and eightieth mile that the trees are large enough to be worth cutting up for building or other purposes. The best wood appears to be a bastard ebony. Alternate blocks of the timber to a certain distance on either side of the line belong to the railway company. From the terminus a post-cart runs to Salisbury and Buluwayo *viâ* Umtali. A telegraph line has been put up by the railway company all along its line, and this will shortly be connected with the Chartered Company's system *viâ* Umtali. There is no wire from Fontesvilla to Beira. A great deal has been done, but before the transport service can be considered satisfactory it will be necessary to extend the railway from Fontesvilla to Beira, or, if that is impossible, to place on the river a larger fleet of flat-bottomed lighters of small draught, and a more suitable steam-tug, able to go up and down at all states of the tides without risk of grounding; to lay a telegraph line from Beira to Fontesvilla; and to establish a more rapid and efficient postal service along the whole route. The northern and southern parts of the territory may for some time be allowed to develop themselves.

So much for the transport route. It has been described first because it is of most importance to Britain. The town trade is also of interest for various reasons. First of all, to get from Europe to Beira one has a choice of five British and one German line of steamers; Bombay, which is very largely interested in all East African trade, is connected by one British line, the German line, and native sailing vessels. The harbour is an excellent one, large and well-sheltered, with good holding-ground, and the entrance is well marked by buoys extending from the open sea to the anchorage, a distance of about twenty miles.

Cargo is landed, as at almost all the African ports, in lighters, which are taken alongside the Custom wharf and discharged by a crane. The landing is done by a British company. In the town all the houses are built of iron and wood, and are, consequently, ill adapted for the climate.

Experiments have been made at brick-making, but the soil is everywhere too muddy. Well-water is not plentiful, and is indifferent in quality, and most residents now depend on the rain-water gathered off their roofs and stored in round galvanised-iron tanks made in the town. In the early days (1892-93), during the dry season, the scarcity of water threatened to be a serious question. It had to be brought from the upper parts of the Busi or Pungwe rivers at a considerable cost. In 1893 a Scotch plumber was imported, and all anxiety on this score came to an end. The supply of native produce for European food is small, and prices rule high as compared with those of older places, like Mozambique, Quilimane, or Inhambane. Near the town there is no ground suitable for cultivation, and no settled native population. Much of the native produce is brought by water from the Busi. Indifferent meat is plentiful, but dear—1s. 6d. per lb. A colony of Greek fishermen keep up a fairly abundant supply of good fish and shrimps. Oysters, too, are obtainable in some places. Milk is very scarce, and butter (fresh) unknown; poultry is not abundant, fowls costing eighteenpence a-piece, ducks three shillings, eggs twopence each. Most European vegetables have been successfully tried by Europeans, but the demand is not great enough to make market-gardening profitable, save to natives, and they appear to be too lazy to trouble about it. Wheat has been grown experimentally on the Busi, and is said to have given good promise. Native servants are dear and indifferent. They come from their homes in various parts of the country, earn good wages for a month or two, and then disappear. The authorities give but little assistance to Europeans in keeping rebellious servants in order, or in bringing back runaways, and consequently even the best of masters are at the mercy of bad servants. The climate is not worse than that of other East Coast settlements, but it is not good. From October to April there is heat and heavy rain, while during May the country dries up, and every one leaves who possibly can; for the next four months the weather is almost pleasant, and health improves. Mosquitos, flies, and other insects make night and day miserable during the hot, wet season. Shooting is best after the long grass has been burnt in the end of July. Good sport can be had almost anywhere along the Pungwe river, beyond a couple of hours' journey from the sea. Buck of all kinds, zebra, buffaloes, and lions are very numerous. In the rivers are many crocodiles and hippopotami, and in the less frequented districts a few elephants are still to be found.

The imports and exports of Beira in 1893 amounted in value to £125,000, of which only £1000 represented transit goods. The first half of 1894, as compared with the same period of 1893, showed a decrease in local imports and exports of £13,000, and an increased value of goods in transit amounting to £15,000. The principal drawbacks to trade in the town are the heavy ground-rents, licences, and taxes demanded by the Mozambique Company, the first amounting in some cases to 10d. per square mètre. The cost of a licence for a general store (not including liquor) is £45 per annum, the liquor licence costing £40 more. Import duties are very heavy, but not higher than in the other ports of the province of Mozambique. There is a house-tax of about 10 per cent.

on the annual value of houses, empty or occupied. The Company makes and receives all payments only in British or Portuguese currency, at the rate of 4500 Reis per pound sterling. To insist upon a good currency is a judicious step, but the low rate of exchange thus fixed is a distinct hindrance to commerce. The usual exchange for currency is from 5000 to 5200 Reis per pound sterling. It is the opinion of many interested in the progress of the place that in the present pioneer state of the colony lighter taxes, etc., and a more liberal policy, would invite and encourage trade. The native tax is 10s. per hut, and 20s. for each marriage.

The non-native population of the town in 1893 numbered 350, of whom about 60 were British subjects, one-half of them Europeans and the other half natives of India.

There is a good hospital and a capital resident surgeon.

A good deal of prospecting and developing of mines has been already accomplished in the Manica and Mutari districts; shafts have been sunk and levels driven, and the promoters of the half-dozen companies and syndicates that have been at work are very hopeful. The insufficiency of the means of transport of machinery has been an insuperable obstacle; but by the railway to Chimoio the fly-belt has been bridged, and heavy goods can be laid down now in country where ox-wagons can readily be employed. This year will undoubtedly see a very great advance in every direction.

ON THE AREAS OF THE LAND AND WATER OF THE GLOBE.

A NEW CALCULATION BY ZONES OF TEN DEGREES OF LATITUDE.

By Professor Hermann Wagner.

According to the calculations published in 1886 in Dr. John Murray's paper on the *Drainage Areas of the Continents, etc.*,[1] the surface of the known lands of the globe have an area of about 52,132,000 square miles. These figures are in close agreement with the results of the labours of other investigators. On the other hand, a later measurement, likewise executed on the maps made by Mr. J. G. Bartholomew, of the areas of the individual continents and islands, and of zones of elevation, gave a very different result. This time Dr. Murray, as will be seen in his article on the *Heights of the Land and the Depths of the Sea*,[2] obtained a total area for the land of only 51,410,700 square miles. This difference was afterwards attributed by Dr. Murray to instrumental errors.[3] In this case the error must be distributed over the individual continents in order to arrive at correct results. The figures found by Dr. Murray ought then to be proportionally correct, but that they are not so the following will show. However, the question what figures represent the exact size of the lands delineated on our maps is of less importance to physical

[1] *Scottish Geographical Magazine*, vol. ii. (1886) p. 553.
[2] *Ibid.* vol. iv. (1888), p. 8.
[3] *Ibid.* vi. (1890), p. 183.

geography than the distribution of the land in individual zones of latitude. Though it be certain that 51,410,700 square miles is less than the true area of the known land by about $1\frac{1}{3}$ %,[1] it cannot be determined which zones are affected by the error, and to what extent.

For this reason I have directed my attention to the working-out, with all the care possible, of a new calculation of the areas of the land lying in each ten degrees of latitude. For this purpose I have used the abundant material which, in conjunction with Dr. E. Behm and Dr. A. Supan, I have published in the *Ergänzungshefte* of *Petermanns Mitteilungen*, under the title of "Die Bevölkerung der Erde." It is only lately that it has been rendered possible to group the areas there given into ten-degree zones. In the year 1881 General Streibitski[2] carefully measured with the planimeter the area of the continent of Europe for every degree of latitude. In 1891, B. Trognitz determined the area of Asia[3] by the same method; in 1893, he measured Africa;[4] and in 1894, Australia, using, in the case of Africa, Habenicht's map, on the scale 1:4,000,000 (about 63 miles to an inch), and for Australia, Petermann's map on the scale of 1:3,700,000 (about $58\frac{1}{2}$ miles to an inch). At an earlier date also Dr. E. Wisotzki determined the areas of the continent of America, and the larger islands, likewise by the same method.

All these materials have now been subjected to a fresh test, and the results are set forth in Table I. The hypothetical land-masses at the Poles are for the present neglected.

TABLE I.—SUPERFICIES OF THE LAND OF THE GLOBE.
(All Islands included.)

Latitudes.	Area in sq. miles.	Latitudes.	Area in sq. miles.
80°-90° N.	147,000	0°-10° S.	4,028,000
70°-80°	1,291,000	10°-20°	3,644,000
60°-70°	5,209,000	20°-30°	3,595,000
50°-60°	5,630,000	30°-40°	1,609,000
40°-50°	6,365,000	40°-50°	385,000
30°-40°	6,016,000	50°-60°	79,000
20°-30°	5,839,000		
10°-20°	4,347,000	Total,	52,064,000
0°-10°	3,880,000		

These figures are so divergent from Dr. Murray's areas, published in 1888, for all the ten-degree zones, that some confirmation of the new results must be sought for. Such I have found in the data of a new calculation of the mean depths of the oceans which has lately been put

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[1] Not 4·4% as Dr. H. R. Mill assumes (*Scot. Geog. Mag.*, vol. vi. p. 265). He apparently omitted the 3,500,000 sq. miles which Dr. Murray assigns to the Antarctic continent.

[2] *La Superficie de l'Europe.* St. Petersburg, 1881.

[3] *Die Bevölkerung der Erde*, No. viii.

[4] *Petermanns Mitteilungen* (1893), p. 220.

forth by a young scientist, Dr. Karl Karstens.[1] He divides all the twenty-seven seas of the globe into trapezes of one, two, or three degrees in breadth. If these areas of the seas of the world be added together, the surface of the land may be indirectly deduced, for the land and water in each zone must together make up its total area. Only the zones between latitudes 60° N. and 60° S. allow of exact comparison, since Dr. Karstens takes as the Polar limit of the great oceans the Polar circles at $66\frac{1}{2}°$, not the parallels of 70°. On placing the two series of figures beside one another, which were certainly obtained by similar methods but quite independently, an astonishing agreement in all the zones becomes at once apparent.

TABLE II.—SUPERFICIES OF THE LAND BETWEEN EVERY TEN DEGREES OF LATITUDE FROM 60° N. TO 60° S.

Latitude.	Square miles.		Difference.
	Wagner. Directly calculated.	Karstens. Indirectly calculated.	
50° to 60° N.	5,630,000	5,634,000	+ 4,000
40° 50°	6,365,000	6,382,000	+17,000
30° 40°	6,016,000	6,004,000	−12,000
20° 30°	5,839,000	5,828,000	−11,000
10° 20°	4,347,000	4,360,000	+13,000
0° 10°	3,880,000	3,870,000	−10,000
0° 10° S.	4,028,000	4,033,000	+ 5,000
10° 20°	3,644,000	3,648,000	+ 4,000
20° 30°	3,595,000	3,604,000	+ 9,000
30° 40°	1,609,000	1,629,000	+20,000
40° 50°	385,000	390,000	+ 5,000
50° 60°	79,000	63,000	−16,000
	45,417,000	45,445,000	+28,000

There can be no doubt that of the two series of figures the values determined by myself for the land surfaces are the more reliable. Though they naturally need numerous corrections, they are not affected by any greater collective error than 20,000 square miles, or about $\frac{1}{3}$ %. Consequently a great advance has been made in the determination of these important areas. For in Murray's figures the errors amount to from 8 to 10 per cent. in individual zones, the most northern being left out of account.

[1] *Neue Berechnung der mittleren Tiefe der Ozeane.* Kiel, 1894.

TABLE III.—SUPERFICIES OF THE LAND.

Latitudes.	Wagner, 1895.	Murray, 1888.	Difference.	Per cent.
80°-90° N.	147,100	112,300	− 34,800	− 3·2
70°-80°	1,290,800	1,379,100	+ 88,300	+ 6·8
60°-70°	5,209,100	4,766,600	−442,500	− 9·3
50°-60°	5,630,350	5,299,900	−330,450	− 6·2
40°-50°	6,365,200	6,225,300	−139,900	− 2·2
30°-40°	6,016,100	6,436,350	+420,250	+ 7·1
20°-30°	5,838,850	5,773,300	− 65,550	− 1·1
10°-20°	4,347,300	4,278,100	− 69,200	− 1·6
0°-10°	3,880,100	3,831,900	− 48,200	− 1·3
0°-10° S.	4,027,600	3,973,300	− 54,300	− 1·4
10°-20°	3,643,600	3,629,750	− 13,850	− 0·4
20°-30°	3,595,150	3,550,200	− 44,950	− 1·3
30°-40°	1,608,950	1,659,250	+ 50,300	+ 3·1
40°-50°	384,600	408,200	+ 23,600	+ 6·0
50°-60°	79,150	87,150	+ 8,000	+10·2
	52,039,500	51,410,700	−653,250	−1·2

Let me now point out where the principal errors in the measurements of the oceans (1888) have crept in.

TABLE IV.—SUPERFICIES OF THE OCEAN IN SQUARE MILES.

Basins.	Karstens, 1894.	Murray, 1888.	Difference.	Per cent.
Arctic Ocean (including Norwegian Sea and Hudson's Bay),	6,035,000	5,907,700	− 127,300	2·0
Atlantic Ocean, .	27,821,600	27,755,750	− 65,850	0·2
Pacific Ocean, . .	57,122,450	55,623,900	−1,498,550	2·7
Indian Ocean, . .	19,140,600	17,320,550	−1,820,050	10·5
Southern Atlantic, .	6,509,200	6,507,750	− 1,450	...
Southern Pacific, .	10,636,300	10,278,500	− 357,800	3·5
Southern Indian, .	9,499,600	9,372,600	− 127,000	1·3
Total, . .	136,764,750	132,766,750	−3,998,000	3·0
Antarctic Ocean, .				

The Arctic and Antarctic Oceans cannot be strictly compared, in view of the various hypotheses concerning the distribution of land and water round the Poles. As for the other oceans, it may be seen that there is a close agreement between the calculations only in the case of the Atlantic (including its southern basin between lat. 40° and 66½° S.), while Dr. Murray in 1888 reckoned the area of each of the other basins at nearly 2,000,000 square miles too little.

If, now, the areas I have found be made the basis for a comparison of the relative proportions of land and water on the Earth's surface, the following scheme is obtained :—

TABLE V.—PERCENTAGES OF LAND AND WATER.

Latitudes.	Land.	Water.
70°-80° N.	28·8	71·2
60°-70°	71·4	28·6
50°-60°	56·9	43·1
40°-50°	52·3	47·7
30°-40°	42·8	57·2
20°-30°	37·6	62·4
10°-20°	26·3	73·7
0°-10°	22·8	77·2
0°-10° S.	23·6	76·4
10°-20°	22·1	77·9
20°-30°	23·1	76·9
30°-40°	11·4	88·6
40°-50°	3·2	96·8
50°-60°	0·8	99·2

I am of the opinion that in the Arctic regions the whole of the unexplored area (about 2,000,000 sq. miles) should not be assigned to sea ; while, as regards the Antarctic, I agree with Dr. Murray that the half of that region may be assumed to be land. 3,500,000 sq. miles seems to me a likely figure. If 250,000 sq. miles be taken in round numbers as the area of the lands yet to be discovered in the Arctic regions, the whole land surface of the globe (including the unknown lands) will then amount to 55,814,000 sq. miles.

Accordingly, the final result is but slightly altered by the new calculation. Dr Murray in 1886 reckoned the land surface to be 55,697,400 sq. miles—almost exactly the same area. The proportion of land to water is 1 : 2·54, also nearly identical. The interest of the work centres in the zones and individual divisions of the land. I have described exhaustively the whole process by which the new figures have been obtained in *Eine Kritische Studie über Areal und mittlere Höhe der Landflächen*, which will shortly appear in the *Beiträge zur Geophysik*, published by Professor G. Gerland in Strasbourg (Bd. II. No. 3).

GÖTTINGEN, *January* 1895.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

LECTURES HELD IN MARCH.

On March 5th, Sir W. Renny Watson lectured on "The Hawaiian or Sandwich Islands" to the Aberdeen Branch. Sir William Henderson presided at the meeting ; and Mr. Ferguson of Kinmundy moved a vote of thanks to the lecturer.

On March 7th, Sir William MacGregor, K.C.M.G., Administrator of the Colony, lectured in Edinburgh on "British New Guinea." The Chair was taken by Professor S. H. Butcher; and Mr. W. Kinnaird Rose proposed a vote of thanks to the lecturer, which was seconded by Dr. John Murray.

Sir Wm. MacGregor addressed the Glasgow Branch on March 12th. Sir W. Renny Watson presided.

The Aberdeen Branch held a Meeting to hear Sir Wm. MacGregor on March 14th, when Mr. C. B. Davidson presided. A vote of thanks to the lecturer was passed enthusiastically, and Mr. Davidson was thanked for presiding, on the motion of Sir Wm. Henderson.

On March 14th, Mr. Aubyn Trevor-Battye, B.A., related his experiences when "Ice-bound on Kolguev Island in Barents Sea" at a Meeting of the Society in Edinburgh. Mr. William C. Smith presided.

Mr. Trevor-Battye repeated his lecture before the Glasgow Branch on March 25th, when the Chair was taken by Sir W. Renny Watson; and at Dundee on the 26th, when Mr. James Henderson presided.

Lectures in April.

Captain F. E. Younghusband, C.I.E., will, on April 4th, deliver a lecture in Edinburgh on "Chitral and Hunza."

He will repeat his address in Glasgow on the following evening (not on April 6th, as announced in the March number).

The Rev. John Ross, D.D., of Mukden, will lecture in Edinburgh on April 18th. His subject will be "Manchuria."

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

Levelling Operations in Russia.—M. Venukoff, in the *Revue de Géographie*, February, states that from 25,000 to 30,000 altitudes have been determined in Russia, from which General Tillo constructed his hypsometrical map. But the value of these determinations, owing to the want of a general system of levels executed with great precision, is not always the same. Accordingly, to obtain a reliable basis for levelling operations, the General Staff, at the instance of General Stebnitzki, undertook a series of measurements along the main railway lines of Russia, and at the end of 1894 Colonel Rylke, who has charge of the work, was able to compile a catalogue of 1090 stations, with their altitudes carefully ascertained with the same instruments and by the same methods. The railways chosen connect the Baltic with the Black Sea and with the banks of the river Ural, and at five points the Russian survey joins on to the German and Austrian. The total length of the lines of levels amounts to over 8000 miles, and more than 6800 miles have been traversed twice. The highest altitudes measured are about 1110 feet, while most of them vary from 350 to 490 feet, so low does the country lie. The most important result established is the identity of the levels of the Baltic and Black Seas and of the Sea of Azof. Whether this level is the same as that of the oceans has yet to be ascertained.

A Balloon Ascent in Germany.—On December 4th Dr. Berson, assistant in the Royal Meteorological Institute, ascended from Stassfurt in the *Phönix*, and, after a voyage of five hours, came to the ground again near Kiel, having reached a height of 30,000 feet (nearly $5\frac{3}{4}$ miles). Dr. Berson was alone in the balloon, and did not lose consciousness, though the thermometer sank to $-54{\cdot}2°$ F., and the pressure was reduced to 9·1 inches. He believed that he could with ease have ascended still higher if he had had more ballast. Dr. Berson has ascended higher than 19,700 feet five times, and in five different months—March, May, September, October, and December. At this height he always found the temperature nearly the same, $-11°$ to $-17°$ F., so that it seems as though the radiation from the earth and the change of temperature with the seasons were scarcely perceptible at this elevation. At 26,000 feet the thermometer marked $-34°$ on May 11th and $-36°$ on December 4th. On the *Phönix* Assmann's aspiration thermometer was used, which ensures a correct record unaffected by solar radiation.—*Verhandl. der Gesells. für Erdkunde zu Berlin*, No. 1, 1895.

ASIA.

Islands off Kamchatka.—Commander Tanner gives, in his report of the voyage of the *Albatross* in 1892, a few notices on these islands, which are little known except by sealers. They consist of two principal islands, Bering and Copper, and numerous rocks and islets. These two large islands are 50 and 30 miles in length respectively, and are traversed by a central range more than 2000 feet in height; their breadth varies from 2 to 17 miles, and the climate is not severe, owing to the influence of the Japanese current. The population, less than 700, is concentrated at Nikolski and Preobrazhenski, and is controlled by elected chiefs under a Russian governor. Every member of the community is bound to perform certain duties, and the pay is thrown into a common fund, from which each man receives a share. Reindeer have been introduced from Siberia, and the natives own small herds of cattle.

Captain Tanner touched at the volcanic island, Bogoslof, and noticed many changes since the previous year. New Bogoslof was still active, but lower by at least 100 feet and altered in outline. Between the old and new volcanoes, a mile apart, where a narrow isthmus existed the year before, there was an open passage several hundred feet in width.—*Bull. of the Am. Geogr. Soc.* vol. xxvi. No. 4, Pt. 1.

Borneo.—Last summer Captain P. H. van der Willigen, of the Dutch East Indian Army, made a journey through Borneo from the west coast to the south. In order to put a stop to the raids of the head-hunting Dyaks, the Kontrolleurs of Melawi in the Western Province and of Kuwala Kapuas were despatched to meet the Dyak chiefs in Tumbang Anoi, and Captain van der Willigen received orders to accompany the former official into the interior, and return with the other. On April 5th he went on board a steamer for Pontianak, and thence ascended the river to Nanga Pinoh, the distance from Pontianak to Nanga Pinoh being 179 miles. From the latter place to the boundary of the provinces, along the Melawi, Ambalau, and Bejawe rivers, is a distance of 107 miles. In this part of the journey great difficulties were met with from the strong current following heavy rains, especially where there were rocks in the river beds. On April 29th the party reached Mentumoi, a Dyak settlement on the Ambalau, 28 miles from the mouth. Beyond this the river was then unnavigable, for, being swollen, it formed falls 3 to 5 feet high. The expedition was therefore obliged to travel by land to Rangoi, the last place on the Ambalau. On May 10th the Bejawe was reached, and was found to be only 16 to 30 feet broad, with only 6 to 10 feet of water, which barely

covered the rocks in its bed. After five hours' march along the bed of the stream, the party were obliged to leave the Bejawe, and drag the canoes and baggage for a distance of more than a mile over the crest of the watershed, 1000 feet high, to the Mahiko in the basin of the Kahayan. It is a tributary of the Dangoi, which flows into the Kahayan. Through Tumbang Mahuroi, the highest inhabited place on the Kahayan, the expedition travelled to Tumbang Anoi, where the meeting of the chiefs was held. On July 25 Van der Willigen left Tumbang Anoi, and, descending the Kahayan, passed through a channel connecting this river with the Kapuas, which he left again at Kuwala Kapuas, attaining the Barito by another channel, and thus came to Banjermassin.—*Globus*, Bd. lxvii. No. 6.

The Flora of Mt. Kinabalu.—In the *Transactions* of the Linnean Society, vol. iv. part 2, Dr. Stapf treats of the flora of Mt. Kinabalu, drawing his conclusions from the collections of Dr. G. D. Haviland in 1892, and also using the material obtained by Sir Hugh Low more than forty years ago, and the more recent investigations of Mr. F. W. Burbidge. Dr. Stapf distinguishes four zones. The first, the Hill Zone, extending from the foot of the mountains up to 3000 feet, is almost entirely occupied by cultivated land and young jungle, in which are found palms of the genera *Areca*, *Pinanga*, and *Calamus*, and numerous bamboos. In the cultivated fields grow *Caladium esculentum*, rice, bananas, tobacco, and vegetables. Next comes the Lower Mountain Zone, extending up to 6000 feet, occupied for the most part by old jungle or primeval evergreen forest, abounding in creepers, epiphytes, and shrubs. The ground is covered with ferns and mosses, and bamboos grow in thick clumps. In the Upper Mountain Zone (6000 to 10,500 feet) two formations occur, namely, evergreen dwarf forest and bogs. The forest consists of stunted, twisted, and weather-beaten trunks, thickly draped with dripping moss and festoons of lichens. Only conifers grow into fine trees in sheltered spots. The shrubs blossom all the year round. Nine kinds of rhododendrons adorn the ridge, and at least five species of pitcher plants are seen climbing the trees or straggling along the ground. Ferns attain their most luxuriant development in this zone. The bogs are confined to a few spots, and produce a *Drosera*, a *Utricularia*, and some interesting plants of Australian affinity. From 10,500 feet to the summit at 13,698 feet, most of the ground is bare rock. Shrubs extend to 12,000 feet, and buttercups, potentillas, and gentians grow in certain boggy spots.—*Natural Science.*

Buru and Ceram.—Professor K. Martin undertook in 1891 a journey for geognostic exploration in the Moluccas, and gives a sketch of the two islands mentioned in the *Verh. der Gesells. für Erdkunde zu Berlin*, Bd. xxvi. No. 9. From the roadstead of Kayeli, the chief village of Buru, the lofty flat mountain of Batubua is a conspicuous object, rising 4625 feet above the sea. It is considered a sacred mountain by the natives, and it was with great difficulty that Professor Martin overcame their scruples and reached the summit. It is thinly covered with wood, the ground is thickly carpeted with *Freycinetia angustifolia* and *Lycopodium spectabile*, and *Nepenthes Boschiana* drapes the lower trees. The Batubua is composed of mica schist; and the hilly country at its foot to the Bay of Kayeli belongs to the primitive schist formation. These hills are not well wooded, but are covered with kajaput and tall grass (*Imperata arundinacea*)—a vegetation indicative of great sterility. Kajaput oil is the principal export of Buru. Another summit, the Kakusan or Ploï, is also visible from the bay. It rises steeply to a height of 1600 feet above the sea, and its highest point Professor Martin was unable to scale, so jagged are the rocks. The summit consists of limestone, and is surrounded by undulating uplands of sandstone. This Buru sandstone certainly

contains organic remains, though they have not yet been determined by microscopic examination, and the rock is not Archæan, but probably Mesozoic, *Aptychi* and *Belemnites* having been found not far from the bay.

To cross the island is a task of enormous difficulty, and many who have attempted it have succumbed to the exhausting effort of struggling through a labyrinth of fallen trees, rocky streamlets, and a network of parasitic plants. Professor Martin caused a path to be cut from the southern shore to the Wakollo Lake, and even then found the excursion most fatiguing. At a short distance from the coast the Gunong Lalmata rises to a height of 1050 feet; a little farther south stands the Pitigawa, 2385 feet, and then the land, gradually rising to the Wakollo Lake, assumes somewhat of the character of a plateau. After seven days, Professor Martin came to the hamlet of Wakollo, at an altitude of 2580 feet, close to the foot of the mountains which encircle the lake. These mountains do not skirt the shores of the lake, but leave around it a wide alluvial plain, intersected by numerous brooks, and covered with the plantations of the natives. Where these are absent, the ground is clothed with luxuriant woods of tree-ferns, and in the swampy surroundings of the lake are seen tall reeds, bamboo, *Pandanus*, sago-palms, and rattan canes.

The lake, 2457 feet above sea-level, loses itself to the south almost imperceptibly in a large marsh. Its longer axis stretches from north to south; and at the northern end a stream issues, the Waë Mbe. There is nothing to justify the opinion that this is a crater lake. The rocks from the north coast to Wakollo are exclusively crystalline schists; while on the south, a long day's journey from the lake, rises a sandstone mountain, G. Tagaloggo, to a height of 3490 feet. From this mountain numerous brooks carry down mud and other detritus to form the alluvium round the lake, while the harder crystalline rocks dam up the water on the northern side.

The natives of Wakollo resemble closely the Alfoers of the north coast of Buru, both having unmistakably the Papuan type. They are peaceful; head-hunting is unknown among them. The village, where the thermometer sinks nearly to 59° F. and the atmosphere is damp and chilly, is not an agreeable place of residence. After passing G. Tagaloggo, which is densely wooded, Professor Martin came to the Waë Mala, and entered a limestone country clothed with grass, kajaput, and scanty brushwood. This limestone exhibits very different petrological characteristics from that of Kakusan. The country sinks towards the southern coast, the elevations round Tifu Bay being only 600 or 700 feet high.

The highest mountain in Buru, the Kapala Madang or G. Tomahu, lies on the west coast, to the north of Foggi, and rises 8500 feet above the sea. This, too, is a holy mountain, and has never been climbed; in appearance it resembles the other elevations formed of Buru limestone. The largest river is the Waë Apu, which flows eastwards into the bay of Kayeli. Its detritus originates from crystalline schists. The plain through which it flows is unproductive. About two hours' journey from its mouth is a spring smelling of sulphur, and with a temperature of 94° F.

The western part of Ceram is, like Buru, mountainous, and only on the south coast are plains of any extent to be found. Between the Elpaputi and Piru bays, on the south coast, a lofty mountain mass culminates in the peak of Tottanivel, about 5000 feet high. On the north coast the mountains approach the sea, often terminating in precipitous walls. The peninsula of Huamual (Little Ceram) is connected with the larger part of the island by a small isthmus only 500 feet high, and the distance from Piru bay to the north-west coast of Huamual may be covered at a quick pace in an hour and twenty minutes, so that this part of the island is very erroneously portrayed in charts. Travelling in Ceram is dangerous,

for the natives are notorious head-hunters, especially the inhabitants of Honitelu, but, through negotiations with the chiefs, brought to a successful issue by the Dutch *Posthouder*, and by presents, Professor Martin was able to visit these people. They are in a low state of civilisation, wear hardly any clothing, and use bamboo bows and arrows for the chase, though some of them possess guns. The people of Wakollo, in the mountains near the north coast, are also notorious head-hunters. In person they are like the natives of Honitelu; but their houses are raised to the height of a man from the ground and have two entrances, one for the men and one for the women, though they consist of only one room.

Professor Martin crossed the island from Elpaputi to Savai Bay, ascending to a height of 2200 feet. Hitherto he had seen only Archæan rocks, chiefly mica schists, but on the hills of the watershed he found limestone apparently the same as that of Kakusan.

The island of Ambon, south of Ceram, consists of two peninsulas—Hitu and Leitimor—connected by an isthmus 1300 yards broad, and only just above sea-level. Both are full of mountains, the highest summit, Salhuti, rising to a height of 4200 feet: it looks like a volcanic pyramid much degraded. In the south-west of the island stands another ruined volcano, the Navaui, 2960 feet high. In Leitimor the structure is totally different, the centre of the peninsula being occupied by a granite mass culminating at a height of 1575 feet in the Serimau. The Uliasser are volcanic, following the line of eruption of Hitu, and are partly covered with coralline limestones of Quaternary age. Several warm springs with water at temperatures of 111° to 157° F. occur here.

AFRICA.

The Capital of Abyssinia.—King Menelik now resides at Addis Abeba, a name by which he re-christened the thermal springs of the Finfinni, situated in about lat. 9° N. and long. 39 E., at an elevation of 9000 feet above sea-level. Ankober, the former capital, is now a city of the dead, its population having been decimated by cholera and famine in 1892; its houses are falling into ruins, and the timber of which they are built is being removed to Addis Abeba for the new dwellings. The latter is daily receiving new inhabitants, and its commerce is gaining in importance. It is situated in a vast amphitheatre surrounded by mountains, which is traversed by numerous torrents, fordable in fine weather, but impassable during the rainy season. The palace stands on a mound in the centre of the amphitheatre, and, surrounded by palissades and walls of stone and mud, has the appearance of an Arab dwelling. The walls are white-washed, and the roofs are covered with reddish tiles; the doors, windows, and steps are painted with bright colours—green, blue, red, and yellow. Around the palace are grouped the round dwellings of the natives, made of stone, clay, or wood, with conical thatched roofs. On other mounds are the house of the Ras Makonnen, the church, and the house of the Coptic bishop. Every day a market is held, and once a week a fair on a larger scale. The Nagadi Ras, or president of the traders, seated on bench of wood or stone under an umbrella of reeds, decides all disputes. The small change of the country consists of pieces of salt, 10 inches long by 1½ to 2 broad and thick, of which, according to the current rate of exchange, 3 to 12 are equivalent to a dollar. The market is thronged by dealers of all kinds, but mostly Gallas, who, squatted on the ground, offer for sale, firewood, corn, skins, butter, chickens, cotton cloth, and numerous other commodities—in fact, all the necessaries of daily life. The caravans take two months for the journey from the coast to Shoa; the goods are transported on the backs of camels, or, in difficult country, on mules.—*Boll. della Soc. Geogr. Italiana*, Nov.-Dec. 1894.

The Niger. M. Henri Busson discourses on the *régime* of the Niger in the *Annales de Géographie*, Jan. 1895. The river rises at about 8° 30′ N. lat., at an altitude of 2790 feet. Flowing first northwards and then to the north-east, it skirts the plateaus of Manding and Beledugu; its bed, crossed by bars, has several different reaches. At Diafarabé the stream separates into two arms which, flowing together in the lake Dhebo (Deboe), do not permanently re-unite until they reach Safay. Here the desert commences, and the upper course of the river may be said to end. Several affluents have already entered it—on the left bank the Tankisso, coming from Futa Jallon, and on the right the Milo and Bagoë. The observations made during recent years by French officers correct Mungo Park's statement that the floods are most marked in August. At Bammaku the rise of the river commences about the beginning of June and attains its maximum in September. At Segu the heights above low-water mark have been found to be 8·7 inches on June 1st, 12½ feet on August 4th, and nearly 18 feet (the maximum) on September 7th; the fall lasts till December.

In searching for the cause we find that the soil, composed for the most part of sandstone and clay, is not permeable, and were it so, saturation by the early rains of summer would soon render it impermeable. In the second place, the Niger never takes the form of a mountain stream or torrent; from the source to Bammaku the change of level is only 62 inches per mile and below Bammaku it is only 3·8 inches. As for the affluents of the Niger, they all, with the exception of the Tankisso, rise on plateaus of so low an elevation that during the rains their sources are confounded with those of neighbouring streams. The climatological element is, then, the only one which need be inquired into. The origin of the floods of the Niger are the tropical rains, so characteristic of the Sudan, which, lasting for shorter periods in districts more removed from the Equator and the sea, commence at the end of May at the edge of the equatorial forest and at the beginning of July on the borders of the Sahara.

Barth, who descended the river from Safay to Say, to whom we owe our knowledge of the Saharian portion of the Niger, and who reported the total absence of affluents along this part of its course, noticed the retardation of the flood at Timbuktu, a fact which has been verified by MM. Jaime and Caron. While at Segu the maximum is reached in September, the water rises at Timbuktu until the middle of January, and does not begin to fall before February; the rise, which is already perceptible at Segu on June 1st, does not become apparent at Timbuktu before July 1st. The cause of this phenomenon was partly guessed by Barth, and his explanation has been amplified by Jaime. The retardation of the flood, he says, is due to two causes; firstly, from Diafarabé to Lake Dhebo, for a distance of nearly 155 miles, the country is almost on a level with the river, and thus forms a gigantic reservoir ready to receive the excess of water; secondly, the two branches of the Niger are hemmed into a narrow space on emerging from the lake. Recent information shows that the rise takes place in successive bounds; for every degree that the river advances northwards, says M. Caron, the fall of the water is retarded a month. On the Upper Niger bars and contractions divide the bed into a series of pools, which must be filled in succession before the water can descend to the country below. And there are, besides, many lakes and lagoons connected with the river by creeks which store for a time the flood waters.

At Say, the Niger, turned southwards by the plateaus of the Sahara, again enters the Sudan, with its tropical rains increasing in quantity towards the Equator. Affluents again flow in to swell the river; a little above the Say the Sorba enters on the right bank: on the left is the river of Sokoto, and, most important of all, the Benue. At Say the highest water is observed in September. It is

impossible to believe that the flood has been accelerated from Timbuktu to Say after it has been retarded between Segu and Timbuktu. The fact is that the Niger at Say is a new river, formed by the rains of this part of the Sudan. Like the Upper Niger, the lower course of the river is not encompassed by mountains; only a few elevated masses occur here and there—in Adamawa and Bauchi on the west and at Wegu on the east. As in the case of the Upper Niger, the cause of the floods is therefore the tropical rains of the Sudan, and as the country is nearer the Equator, these rains are more abundant, and the floods consequently higher; the lower Niger rises 33 feet and the Benue 16 to 20.

As for the lesser flood of the Lower Niger, for which many causes have been suggested, M. Busson, on the authority of M. Mizon, denies its existence.

The Fauna of Uganda.—Though this country is so well known by name in Europe, its zoology has hitherto been but superficially investigated. Speke and Grant brought home collections of mammals and birds, and introduced to science several interesting forms; but so little was known of the fauna up to quite recent times that the reports of Emin Pasha, Stuhlmann, G. A. Fischer, and Jackson excited the greatest interest. It was discovered that many of the species inhabiting the country were identical with typical West African forms, or were closely allied to them, and it was in consequence inferred that the West African fauna extended to the Victoria Nyanza. Last year Oskar Neumann, on his march from Masailand to Kavirondo, determined the south-eastern limit of this western fauna at the pass before the Ngare Mbusi; and on the east of the lake, near Kitoto, found three typical western mammals, which had never before been noticed east of the Congo. These were a marmoset which also lives in the *Hinterland* of Cameroons; a large black monkey with white nose, which Dr. Stuhlmann discovered also to the west of the Ituri; and the Harlequin (Mona?), the most variegated of the African monkeys, a few specimens of which have been brought to Europe from the Congo.

Oskar Neumann traversed Uganda between the Ripon Falls and Ntebi four times, at different distances from the shores of the lake, making collections and diligently observing the fauna. While Jackson and Stuhlmann turned their attention particularly to the small mammals, Neumann studied chiefly antelopes, beasts of prey, and monkeys. Though Uganda is thickly peopled, large numbers of elephants still exist in many parts; near Kwa Mtessa on the Mayanga (?) the traveller saw three herds, each containing thirty to fifty animals. Hippopotami are common everywhere, while the rhinoceros is apparently absent. Buffaloes suffered severely from the great cattle plague which raged in East Africa a few years ago, and their spoor was seen only once. The zebra of the kind discovered in the Berlin Zoological Garden by Dr. Matschie, and described as Bohm's *Tigerpferd*, is abundant in all parts of the country. Giraffes are said to exist in the extreme north of Uganda. Of antelopes Neumann obtained nine species, not one of which is found on the east coast of the German territory.—*Verhandl. der Gesells. für Erdkunde zu Berlin*, No. 1, 1895.

Central Africa.—The following details of Count von Götzen's explorations, of which some account was given on p. 30 of this volume, are extracted from the *Mouvement Géogr.*, No. 4, 1895. For the first time a European has penetrated into the kingdom of Ruanda, of which only vague reports were brought home by Stanley, Stuhlmann, and Baumann, who skirted its eastern frontier. On the east it is bounded by the river Kagera, and where this river bends southward a new lake, named Mohasi, was discovered. Ruanda is thickly peopled by a fine race with a large admixture of Galla blood, and is governed by a chief named the

Kigeri, who possesses about a dozen residences. Arab bands have tried in vain to obtain a footing in the country.

Lake Kivu extends from north to south in an oval form and is intersected by the second parallel of south latitude. It lies in the territory of the Congo State, about midway between the Albert Island and Tanganika, at an altitude of 4900 feet. On the east and west it is dominated by the cliffs of the great cleft that contains the lakes and rises to the volcanic mass of the Virunga mountains. At the southern end of the lake, from which issues the Rusizi, is a large island named Kwiswi.

On June 27th the expedition quitted the lake, and entered an extremely mountainous country rising to summits of 8800 feet. For four days the travellers suffered severely from cold, the thermometer falling at night to 38° F. Immense forests of gigantic bamboo are scattered over the country. At about 38° 10′ E. long. the equatorial forest was entered, here much less dense than in its northern part described by Stanley. It is a fine country abounding in picturesque clearings. The natives, the Bulegga, are not numerous. The first important village was Mkashi situated on an affluent of the left bank of the Lowa. The latter, where the travellers crossed it, is a fine river 300 yards broad ; flowing from the east it descends from lofty plateaus in a succession of rapids. Farther down it receives two important tributaries from the north-east, first the Oso, and then the Luvuto. Before reaching the Congo the last of the cattle bought from the Masai were consumed, but Lieutenant Simon of the Kirundu station, hearing of the approach of the expedition, went to its assistance.

AMERICA.

Niagara Falls.—*Natural Science* for February, quoting from the *American Journal of Science*, gives Mr. J. W. Spencer's conclusions as to the history of the Niagara Falls. On the measured rate of retrogression during forty years, upon the change of the descent of the river from 200 to 420 feet and back to 320 feet, and upon the discharge of water, at first from the Erie basin only, and then from all the great lakes, he bases his calculations that the Niagara Falls are 31,000 years old, and that the river has existed 32,000 years ; also that the Huron drainage was diverted from the Ottawa river into Lake Erie less than 8000 years ago. If the terrestrial deformation continues at its present rate, the Niagara Falls will come to an end in about 5000 years by the turning of the waters into the Mississippi. Lastly, it is roughly estimated that the lake epoch commenced 50,000 or 60,000 years ago, that there was open water in even the Ontario basin long before the formation of Niagara, and that there could have been no obstruction in the Ontario basin at the end of the Iroquois episode, which ended 14,000 years ago, if even then.

The Rainfall of the Hawaiian Islands.—In an article in the *Meteorologische Zeitschrift* for January, of which we have received a reprint, Professor Hann discusses the rainfall of these islands. The yearly fall on the east coast of Kauai is 48·7 inches ; on the south-west coast of Oahu 35·8 ; on the north-west side of Maui 39·4 ; on the north-east coast of Hawaii 120 ; on the south coast 44·9, and on the west coast 50. The chief rainy season on all the islands, and on all sides of them, is in winter, from November to March. The agreement in this respect is very remarkable, except on the lee side of the lofty mountains of Hawaii, where it rains more in summer than in winter. Also a season of lesser rains in the middle of summer (July) is shown in all the records. The proper rainy season begins when the trade wind becomes feeble, and south and south-west winds blow for

days together. A winter rainy season in such low latitudes (19° to 22°) is very singular. The variations in the annual rainfall, in certain parts at any rate, are very great. At Hilea in Kau (south side of Hawaii) 44·5 inches fell in 1886, of which half were recorded in November, while in 1889 only 13·9 inches fell. Similar instances are given from other parts of the group.

Professor Hann gives full details of the rainfall in all the islands, with numerous tables.

Colombia.—M. de Brettes, writing to the Paris Géogr. Soc. (*Comptes Rendus*, Nos. 18 and 19, 1894), reports that in September last he explored the northern part of the Taïrua territory, which had been visited only by Garcia, Pedro de Lerma, and Alonzo Luiz de Lugo early in the sixteenth century, and also the central part of this unknown region. The Taïrua valley, formerly densely peopled, is now quite deserted. Even game is rare, and a parasitic plant with edible roots is the only vegetable food that grows in the forest. M. de Brettes has surveyed the country and measured the extent of the Taïrua valley—350 miles. He has also determined the position of numerous summits in the vicinity of the course of the rivers. He has furthermore discovered the site of the town of Sincarona, sacked in 1571 by the Spaniards under Diego de Andrade, and of two other towns situated respectively at 3·7 and 14 nautical miles from the mouth of the Buritaca. It is rare, he remarks, to find such a large number of ruins on so small a space as that between the capes San Augustin and de la Aguja, extending southwards for a distance of about 20 miles to the summits of the Sierra Nevada de Santa Marta. The whole country is an archæological mine. Large quantities of articles in gold and implements made of polished stone are found.

The Territory in dispute between France and Brazil.—In the *Bull. de la Soc. de Géogr. Commerciale*, Fasc. 1, 1895, M. Coudreau treats of the disputed territory to the south of French Guiana. By the treaty of Utrecht France resigned all right to the navigation of the Amazons and to the possession of the country on the northern bank of the river. But two questions remain to be solved. Firstly, did the territory renounced by France include the southern slope of the mountains? And, secondly, is the river Vincent Pinçon, which was defined as the boundary on the coast, the Oyapok or the Araguary? Brazil fixes the boundary along the Oyapok and the watershed from the sources of the Oyapok to those of the Rio Branco, while the French Government claims the island of Maraca, and lays down the boundary along the northern branch of the Araguary, the Lower Araguary as far as the first fall on the river, and then along a line passing through the first falls on the affluents of the Amazons to the Rio Negro. The Rio Branco is to form the western frontier from its mouth to its first fall, and thence the line will run to the extreme summits of the central chain of Guiana, here called Caïrrit. The territory in dispute has an area of about 190,000 square miles or little less than the French possessions in Indo-China. Maraca is of importance from its position near the mouth of the Amazons and as the only natural port along 300 miles of coast; and the rest of the territory abounds in savannahs excellent for grazing, in forests of valuable trees, particularly caoutchouc and gutta-percha (the *balata* of Guiana), and in alluvial gold.

OCEANS AND GENERAL.

The "Princess Alice" in the Atlantic and Mediterranean.—In a paper read before the Académie des Sciences, of which we have received a reprint, the Prince of Monaco gives an account of his investigations during the years 1892, 1893 and 1894.

Fifty-eight soundings were taken in the western basin of the Mediterranean, the Straits of Gibraltar, and the Bay of Biscay, and off the coasts of Spain, Portugal, and Morocco, the lowest being 2678 fathoms. In the same parts, the Bay of Biscay excluded, 46 samples of water were collected, the lowest being obtained in 1801 fathoms, and a number were taken daily from the surface.

The buoys attached to the zoological apparatus, which was let down in 1894 to a depth of about 2700 fathoms and left for a day or two, constituted fixed points by which the direction and velocity of the currents might be determined. At a distance of 80 miles from the coast of Morocco the direction changed during 24 hours from S. 19° W. to S. 19° E., no doubt under the influence of the tides. From this part northwards to the Bay of Biscay the current nowhere deviates much from the south.

The soundings in the Mediterranean proved the scarcity in this sea, noticed by earlier explorers, of fish that can be caught by a trawl, but between Monaco and Corsica fish and *Crustacea* comparable in number to those of the Atlantic were brought up by the collector (*nasse*). In the Atlantic the work in 1894 was much hindered by continuous northerly winds, but twelve descents of the collector yielded interesting results. Seven large conger eels brought up from a depth of 505 fathoms showed great vitality, though the inflation of their swimming bladders would have led one to suppose that the diminution of pressure on the organs must have caused death. On Gorringe Bank, lat. 36° 31′ N. and 13° 54′ W. long., an extraordinarily abundant fauna was found, and a collector let down to 915 fathoms off Corunna brought up 251 fishes, *Simenchelys parasiticus* and *Synaphobranchus pinnatus*. This is the first time that these fishes, abundant near the Azores, have been found in European waters. A *Centophorus* caught in the Bay of Biscay was reduced to a skeleton by the ravages of small *Crustacea*. Four dredgings in the Atlantic yielded somewhat insignificant results. M. Jules Richard dissected a number of fishes, dolphins and tortoises in search of parasites and to examine their food. In the stomach of a dolphin caught in the Mediterranean a new cephalopod (*Ctenopteryx cyprinoïdes*) was found.

Mr. J. Y. Buchanan has examined the samples of water. The density of the Atlantic water is maintained all along the southern coast of Spain as far as Cape de Gata. Beyond this point is the denser Mediterranean water. The ratio of the salinity to the alkalinity is higher in the Atlantic than in the Mediterranean. The difference is not great but quite distinct; in the Atlantic the mean obtained from twenty waters was 0·5000, the maximum being 0·5086 and the minimum 0·4932, while in the Mediterranean the mean of nineteen samples was 0·4875, the maximum being 0·4925 and the minimum 0·4815. Thus the maximum co-efficient for the Mediterranean is less than the minimum for the Atlantic. The small differences in the Mediterranean are probably due to the abundance of calcareous rocks on its coasts.

The Movements of the Magnetic Poles.—The proposed American expedition under Prof. Langley to search for the present position of the North Magnetic Pole has suggested to Prof. G. D. E. Weyer, of Kiel, the work of calculating the movements of the Poles from long series of observations at nineteen stations. The stations he has chosen have their magnetic meridians intersecting at right angles, and the periods of observation vary from 167 years at Stockholm to 369 at Paris. Hence Prof. Weyer has calculated the Magnetic Poles in the years 1680, 1710, 1740, 1800, 1830, 1860, and 1890. The position of the Northern Pole was 80° 28′ N. and 150° 0′ W. in 1680, and its lat. and long. gradually decreased through the following century. In 1800 the long. was 92° 7′ W., after which it began to increase,

attaining 119° 10′ in 1890, while the lowest latitude, 77° 0′, occurred in 1830, the Pole gradually ascending to 78° 51′ in 1890.

The South Magnetic Pole, starting in 1640 at 67° 55′ S. and 164° 15′ E., moved westward during the whole of the period, its longitude in 1890 being 93° 23′ E. Its latitude increased up to 74° 24′ S. in 1830, and then decreased to 72° 59′ in 1890. It will thus be seen that the movement of the Poles is very considerable, and that the South Magnetic Pole does not follow a path corresponding to that of the North. Prof. Weyer has tested his results by several special investigations which have on the whole confirmed their accuracy. It is, however, somewhat suspicious that the position of the North Magnetic Pole as determined by Ross in 1831, viz., 70° 5′ N. and 96° 46′ W., is far removed from the position, 77° 0′ N. and 95° 38′ W., calculated by Prof. Weyer. As the writer in the *Deutsche Geogr. Blätter*, Bd. xvii. Heft 4, points out, the determination of the Pole by Ross is very uncertain, but nearly 7° of latitude seems a wide range.

The Moon and Rainfall.—Prof. A. A. Hazen made in 1880 a special investigation of the rainfall in relation to the changes of the moon. For this purpose he used the precipitation records of the Weather Bureau, and found that half as much rain again fell at the time of new moon than at full moon. A record of one hundred years at London yielded, however, a negative result, and also a study of the rainfall of the whole country. Lately he has returned to the question, and has arranged the rainfall of twenty-three years at New York City, New Haven, Conn. and Boston, Mass. according to each lunation, and then summed the 296 lunations in groups of about 100 each. The results are shown in a table in the *Am. Meteorol. Journ.* Feb. 1895. While both New York and New Haven show an increase of rain at the time of new moon, the figures at Boston indicate a marked maximum on the day of new moon and an equally remarkable minimum on the seventeenth day of the lunation, or two days after full moon. There are at times remarkable reversions, a minimum point in one curve coinciding with a maximum in the next, but, on the other hand, there are remarkable coincidences, among them a marked maximum on the twentieth day of the lunation in the whole series. Prof. Hazen does not decidedly affirm that the rainfall in the neighbourhood of Boston is affected by the moon, but thinks that the results encourage further investigation.

MISCELLANEOUS.

The production of **wheat in Argentina** and its export are increasing rapidly. In 1889 the wheat crop amounted to 16 million bushel, and in 1894 had reached 100 millions. About half of the wheat is exported to Germany.—*Deutsche Rundschau*, Jahrg. xvii. Heft 6.

On October 13th the first section of the **Usambara railway**, from Tonga to Pongwe, was opened to traffic. Its length is only 9 miles long, but the surface of the ground presented great difficulties to be overcome; the gradient is sometimes 1 : 45.—*Deutsche Rundschau*, February.

On December 25th the **railway** from Phu Lang Thuong to Langson in **Tonkin** was opened to traffic. The train leaving Phu Lang Thuong at 7 A.M. arrived, after a halt of two hours at Lon Gye, at 1.45 P.M. at Langson, the speed being, therefore, 12½ miles per hour.—*Revue Française et Exploration*, Jan. 1895.

The *Quarterly Journal of the Geological Soc.*, No. 201, contains a paper by Mr. J. E. Marr on **The Tarns of Lakeland**. After examining each separately, he comes to the conclusion that they are not rock-basins. In some cases it is clearly shown

that a moraine-blocked valley certainly exists, while in others it probably or possibly does.

The Norwegian whaler *Antarctic* (see vol. x. p. 266) has returned to Melbourne from a voyage towards the **South Pole**, having advanced to lat. 74° S. Only two navigators have attained a higher southern latitude, namely, Weddell in 1823 (74° 15′), and Sir James Clark Ross in 1842 (78° 10′). Commercially, the voyage was not a success.

Kuchan, in Persia, which was destroyed by an earthquake in December 1893 (see vol. x. p. 100) and was afterwards rebuilt, was again overthrown on January 17th of this year. The town was destroyed by the first shock in the space of three minutes. Six hundred persons were buried in the ruins of the mosque and as many more in the baths and other public buildings. The population of the town is about 10,000.—*Deutsche Rundschau*, Jahrg. xvii. Heft 6.

The question of a new capital for **Brazil** is still undecided. Dr. Cruls set out again for the scene of his labours in the middle of last year, intending to work for four years ; meanwhile the choice of a site is being discussed in Congress. On the other hand, the founding of a new capital for the state of Minas Geraes is proceeding rapidly. The old capital, Ouro Preto, situated in steep ravines on bare mountain slopes, is decaying, and is by no means a worthy centre of one of the largest States of Brazil, with a population of 2½ millions. A site has been chosen in Bello Horizonte, a hitherto unknown locality at the geographical centre of Minas, and for the last half year building has been pushed on vigorously.

A third new capital, Florianopolis, is also spoken of, but this is only a new name for Desterro, the capital of Santa Catharina. To remove the stain of its capture by the revolutionary Admiral de Mello, the town has been re-named after Marshal Floriano.—*Verhandl. der Gesells. für Erdkunde zu Berlin*, No. 1, 1895.

NEW BOOKS.

The Protected Princes of India. By William Lee-Warner, C.S.I. London and New York : Macmillan and Co., 1894. Pp. xix + 389.

The subject of this work is one of great interest, both historically and from the standpoint of practical politics. That this must be the case is self-evident, when it is remembered that there are more than six hundred principalities and states in India which have preserved, if not complete independence, at least their sovereignty and immunity from annexation, in spite of all difficulties arising from their past history, their geographical position, and the personal character of their absolute rulers. Mr. Lee-Warner has made it his object to show how this result has been brought about, to trace historically the development of the existing situation, to set in a clear light the actual relations between those states and the paramount Power, and the policy pursued in regard to them by the latter, and to formulate with some definiteness the principles in accordance with which the new questions should be dealt with which are certain to emerge from the inevitable changes in all human societies. We took up the work with grave doubts whether the inquiry was a profitable one, and with the feeling that the attempt to reach precision in matters which do not admit of it might do more harm than good. The relations between the parties are friendly, and there is an absence of friction ; the mutual liabilities have been modified from time to time in the past, and must undergo

modification in the future. It seemed hardly wise to define too precisely what limitations on action are imposed by agreements made when circumstances were very different, and so perhaps aid in creating obstacles to changes imperatively demanded. But a perusal of the book itself has completely dissipated these doubts. Mr. Lee-Warner has handled his subject with great ability, and in a wise, statesmanlike spirit. The work is based upon adequate knowledge of the history, and careful study of the available materials, and is written in a clear and attractive style. It will be of great value to men in the Indian Services who are brought into relation with native states, and to English politicians who take up questions affecting them. In fact, containing as it does a comprehensive and intelligent account of the agreements between the parties and a masterly attempt to grasp and express the principles by which the paramount Power is more or less consciously guided, it supplies a want which must often have been felt. After an elaborate historical survey of the three distinct periods in the development of the relation between the paramount and the protected Powers, each marked by its own leading idea, Mr. Lee-Warner discusses in full detail the policy of the final or existing stage. This policy, described as that of subordinate union, combines a larger attention to matters of common welfare with restriction of interference in internal administration within the narrowest limits, and scrupulous regard to the spirit of former agreements. The consistent and judicious application of such a policy is not possible without a clear apprehension of the principles which it embodies, and this manual with its lucid and temperate exposition of those principles will be found of great service to all who have to apply them in practice. The concluding chapter, which is devoted to a criticism of the names which have been used to describe the position of the protected states, has an academic rather than a practical interest, but is useful as showing that being drawn from instances which are not exactly analogous, they are more likely to mislead than to illuminate. The relation is really *sui generis*. There is no exact parallel to it in history. The nearest is the ideal which was cherished by Dante and other mediæval thinkers of the right relation between the Holy Roman Empire and the other Christian states which had been formed out of fragments of the Old Empire. That ideal, which was in Europe never more than a dream, has been in a measure realised in India, and that it is so is the peculiar glory of Great Britain and her Indian Government.

The Indus Delta Country. A Memoir, chiefly on its Ancient Geography and History. By Major-General M. R. Haig, M.R.A.S. London: Kegan Paul and Co., 1894. *Price 5s. net.*

The Indus is notable even among Indian rivers for the frequency with which it has altered its course. Its waters at the present day proceed to the sea by channels which, generally speaking, lie much farther to the west than those in which it ran in the days of Alexander the Great. The results which have followed from its changes have frequently proved disastrous in the extreme. The regions to which it had previously been the very fountain of life have been reduced by its disappearance to arid, depopulated wastes; while the cities and villages which had crowned its banks, being left to solitude, gradually mouldered into dust, until scarcely a vestige has been left to mark the site whereon they had stood. The desert wastes, on the other hand, into which the river diverged after having burst its old barriers were ere long fertilised by its inundations, and became the seats of new villages and new cities, all in their turn doomed to ruin and oblivion when the river should next wander into a new bed. The lower portion of the Indus valley was especially subject to these vicissitudes, and the maps of it in the work under notice exhibit it as all throughout scored with tracings of the old beds. From all this it

will be obvious that the history of this region, of which the geography has so often been revolutionised, must be involved in much obscurity and uncertainty, and bristle with not a few thorny questions. It is in these circumstances most fortunate that such an experienced engineer as Lieutenant-General Haig, who is, moreover, an exact classical and Oriental scholar, has given the world the results both of his survey of the geography and hydrography of the Delta country, and of his examination of the original documents in which its history has been recorded. In the preface he describes his memoir as nothing more than a rough guide for those in Sindh whose interest in its past leads them to seek out the relics of former ages and to trace for themselves some picture of the country as it was at different periods of its generally troubled history. This is a very modest description of the nature of the memoir, which is in reality a masterly work, and will inevitably take rank as the standard authority on the subject of which it treats. Every page of it bears witness to the author's learning, to his industry in research, and to the acuteness and soundness of his judgment. He has divided his treatise into nine sections. After sketching in the first the existing geography and hydrography of the Delta country, which he takes to extend northward as far as to the latitude of Haidarabad (25° 23′ N. lat.), he discusses in the second its condition at the time of Alexander's expedition, to the historians of which we are indebted for our earliest knowledge of it. Here he traces the route by which Nearchus, the admiral of Alexander's fleet, sailed down the western arm of the Indus from the dockyards at Killouta to a sheltered and commodious haven near where Karachi now stands. He shows how the configuration of the coast in this direction has been altered, and gives it as his opinion that since Alexander's time the Delta has advanced seaward 6 miles, and made Krokala, which was then an island, a part of the mainland. On the vexed question of the site of Patala, which stood at the apex of the Delta, he differs from all his predecessors in the same field of inquiry, and fixes it at a point some 35 miles to the south-east of Haidarabad, which has generally been regarded as its true position. We may here observe that he is in error in assuming the year 326 B.C., instead of the year following, as that in which Alexander left the Delta to return home.

In the next three sections he depicts the changes successively wrought in the Delta by the caprice of the Indus and its branches in changing their courses, from the time of Alexander downward to the tenth century. The facts on which this part of his narrative is based he has gathered from Greek works, such as the *Periplus of the Erythræan Sea* and Ptolemy's *Geography*; from the *Si-yu-ki* of the Chinese pilgrim Hiouen Tsang; from native sources, of which the chief is the old local chronicle known as the *Târikh-i-Hind wa Sind*, and also as the *Chach Nâma*; and, finally, from such geographers as Istakhri, Ibnu Hawqil, El Masúdi, and other Eastern authors. In this part of his work he gives us, chiefly from the *Chach Nâma*, a history of the inroads made by the Arabs from the western banks of the Indus into Sindh, and of the final conquest of the whole of that province by their arms. Under the Arab sway, Dêwal or Dêbal, which was originally a pirate stronghold, rose to be the greatest emporium of commerce in the Delta. Our author fixes its site at Kakar Bukéra, a place some 21 miles to the south-west of Thata, with which some authorities have identified it.

The sixth section is mainly devoted to the history of the times when the tribal chiefs of the Sûmras, the Samâs, and the Arghun, taking advantage of the waning power of the Khalifat, established themselves successively in Sindh as independent sovereigns. The remaining sections carry down its history till its conquest by the British arms in 1843. The work concludes with an appendix of five papers, of which the last two, dealing with Alexander's march to the Arabius and the voyage of Nearchus to the mouth of the same river from Alexander's Haven near Karachi,

will prove extremely interesting to classical scholars. It is illustrated with three sketch-maps, but is without an index, an omission much to be deprecated.

Rulers of India.—John Russell Colvin, the Last Lieutenant-Governor of the North-West under the Company. By Sir Auckland Colvin, K.C.S.I., K.C.M.G., C.I.E., lately Lieutenant-Governor of the North-Western Provinces. Oxford: At the Clarendon Press, 1895. Pp. 214. *Price* 2*s.* 6*d.*

In this work, which narrates the life and portrays the character of one of the distinguished men who have played an important part in the administration of India and exemplified the worthiest ambition of the country they represent, Sir A. Colvin has made a most valuable contribution to the series of monographs on Rulers of India. He has executed a delicate task with good taste, admirable judgment, and great literary ability, and has reared a worthy monument to a man endowed with great vigour of understanding and character, and distinguished by undeviating and earnest endeavour to promote the efficiency of the administration and the welfare of the people, and by a devotion to duty which shrank from no toil. The balance has been well held between the various elements which go to make up the picture. Just so much of the private life has been told as is needful to exhibit the character of the man; the public life has been treated with as much fulness as the important position which he occupied merited; while the short digressions on the scenes and surroundings amidst which his lot was cast are not more than sufficient to give colour and liveliness to the narrative. The parts of the public life to which most attention has been given are those concerned with the first Afghan War and the Indian Mutiny, in relation to which Mr. Colvin's policy and action have often been severely criticised and condemned. Sir A. Colvin has shown, by unimpeachable evidence, that his father's action has been seriously misrepresented, and in regard to both the vindication of his memory must be pronounced a triumphant success. We understand that this volume is the last of the series.

Sul Rio della Plata: Impressioni e Note di Viaggio. Del Dott. A. Scalabrini. Como: F. Ostinelli, 1894. Pp. 483.

An Englishman, on hearing the word America, naturally thinks of the United States; an Italian, on the contrary, of South America. For years past there has been a steady outpour of the superfluous and adventurous portion of the Italian Peninsula into the Argentine Republic, Paraguay, and Brazil. Dr. Scalabrini gives some statistics on this point. In Buenos Ayres, out of a population of over 955,000, no less than 640,000 are Italians. The whole population of the Argentine is about four millions, two-thirds of whom are Italian by birth or parentage. In Uruguay, out of a total population of 500,000, there are 120,000 Italians, and about a quarter of the total value of property at Monte Video is held by them. They form, in fact, the richest and most important European colony. Their position is worst in Brazil. For though the country contains 800,000 Italians, two-thirds of them are in the position of small peasants or day-labourers. Those that work on the coffee plantations have to do what was formerly done by slave labour, and there they are very badly treated and live a truly wretched existence.

In his tour through the Argentine, the Doctor describes the horrors of travelling by diligence, owing to the fearful state of the roads and the recklessness and carelessness of the drivers. Though not accustomed to ride, he preferred a horse when he could get one. Travelling by steamboat is little more comfortable; the passengers are overcrowded, and the mosquitoes give no rest. He did not find the agricultural colonies in a flourishing condition. From the great rise in the value of

land, the colonist no longer gets a free grant, but has to pay for it. He has to borrow at a very high rate of interest; and as the price of cereals has fallen, he has great difficulty in making the two ends meet. The climate is so uncertain that, instead of expecting one bad year in ten, as in Europe, he has to allow for three bad years in each decennium. In the provinces of Mendoza and San Juan thousands of acres are under vines, but the grapes are not adapted for making wine. They are watery, and wanting in alcohol. The juice has to be boiled at a high temperature, and the result is a syrupy fluid in appearance like wine, but lacking its best qualities.

Dr. Scalabrini gives, besides this, a great deal of interesting information on the education, political history, and commercial prospects of the country, which is well worth attention.

Viaggi d'un Artista nell' America Meridionale. I Caduvei (Mbayá o Guaycurú). Di Guido Boggiani. Con Prefazione ed uno Studio storico ed etnografico del Dott. G. A. Colini. With a Map, 112 Illustrations, pp. 339. Roma: E. Loescher and Co., 1895.

In looking at a map of Brazil, one sees many blank spaces. One of these, lying between lat. 20°–21° S. and long. 58°–57° W., has now been reconnoitred by Sig. Boggiani. Being without instruments, he was unable to take any observations; but he rowed up the river Nabilecche, an eastern tributary of the Paraguay, proceeded by land to Nalicche, where he lived for two months and a half with the Caduveo natives, and brought back some interesting information about them. As a people, they possess the great merit of cleanliness; they bathe two or three times a day, and shave all the hair off their faces and bodies. Like other uncultivated peoples, they chip the front teeth into points. The face, the upper part of the body, the back, and sometimes the lower leg, are painted in geometrical and other patterns, which show great skill on the part of the artist, generally a woman. For the more complicated designs they sometimes use a sort of wooden stamp, which is dipped into a coloured fluid and then applied to the surface to be decorated. The designs drawn on the body only last six or seven days, as the colour or stain readily washes off. The designs on the pottery are very varied, rich, and artistic. Many of them have been copied by the author, and are splendidly reproduced in the volume before us. He finds such a striking likeness between patterns on this pottery and that of Peru in the time of the Incas, that he hazards the proposition that the Caduveos and Incas must belong to the same race.

Like all natives of America, whether in the northern or southern hemisphere, the Caduveos are extremely insensible to pain, and easily recover from wounds that would cause the death of a European. Their greatest and most fatal weakness is their love of *pinga* or coarse brandy, though they do not seem to know how to distil it for themselves. Whenever a Caduveo can do so, he gets drunk. But he does not care to do this alone; he must be in company. The whole village turns out, every one sits down, bottle after bottle is opened, till all the liquor is gone and most of the guests are dead drunk. The Caduveo, however, does not brawl when in his cups; he only becomes uproarious, and next morning cries and weeps like a child over the consequences that follow intoxication. In this he differs from other Indian tribes on the Paraguay, who become bellicose when drunk, and draw knives and revolvers, so that a drinking bout generally terminates with manslaughter. Some of the games played by children and grown-up people are described. One is called the "sheep and the wolf," another is a sort of hockey. But the favourite amusement is dancing. Nearly every night there is a dance, the steps of which are difficult to learn, but which the author has managed to explain by means of

diagrams. The numerous illustrations, whether from the author's water-colour drawings of the landscape, or his sketches of the natives or of the pottery, are excellent, and the book is certainly to be recommended.

Trans-Caspia. The Sealed Provinces of the Czar. By M. M. Shoemaker. Cincinatti: The Robert Clarke Company, 1895. Pp. 310.

In May 1894, Mr. Shoemaker, an American, left St. Petersburg with a Dutch friend for Tiflis, Baku, and Trans-Caspia. Being an American, the author says he received permission to travel from the Russian authorities, which they refused to an Englishman, an Indian official. "I am warned by the authorities," he adds, "to be careful and state upon every occasion that I am an American." Passing Mount Elburz, "Europe's grandest mountain, whose peak soars 4000 feet higher than Mont Blanc," the author arrived at Vladikavkas, "this side of the Caucasus." He crossed the Dariel Pass in a victoria, and reached Tiflis, the ancient capital of Georgia. The author advises all tourists to take a carriage, and not the stage, in driving from Vladikavkas to Tiflis. At the latter city he witnessed the blessing of the Russian troops by priests. "Russia does not neglect the religious welfare of her troops. Daily attendance at mass is required." From Tiflis, our author proceeded by rail to Baku, where he found "oil, oil, everywhere—in the gutters, in the mud of the streets, in the food one eats, and in the air one breathes! How the people manage to live is hard to understand." Across the Caspian, "a stormy sea," Usunada was reached, and then the Trans-Caspian Railway carried the author to Bokhara. Trains run on this railway only three times a week, and the journey between Usunada and Samarkand, 900 miles, occupies *sixty hours*. The author calls Trans-Caspia "a black desert," and asks, "What does Russia make by the possession of a land like this? Simply, I fancy, the holding of a watch-tower in the direction of India and the English, with perhaps an eye to China." From Samarkand, which is situated in a smiling oasis of the desert, the author drove in a tarantass to Tashkend, where he says "there is absolutely nothing worth seeing," then on to Kokand, and finally to Osh, 500 miles from Samarkand. Entering China, he became ill, and, his companion having previously left him, he found himself "alone in a Chinese desert, whose blazing cliffs almost grilled me with their reflected heat." So he turned back to Fort Irkeshtan, "Russia's last Fort," and abandoned his intended tour to the Vale of Cashmere. He returned to the Caspian and Baku, and then went to Batoum and Constantinople. Mr. Shoemaker writes with ease, vigour, and originality, and his prettily illustrated book only wants a map—such a one as the orographical map by Mr. Bartholomew in vol. vii. p. 74 of this *Magazine*—to complete its interest and value.

The Russian Jews. Extermination or Emancipation? By Leo Errera, with a Prefatory Note by Th. Mommsen. Translated from the French by Bella Löwy. London: David Nutt, 1894. Pp. 206. *Price 3s. 6d.*

The sentiment of pity seems to be entirely wanting in the hearts of all Russian functionaries that have to do with Jews. Because the country is conventionally known as Holy Russia, they must needs make it as much as possible a Hell for the unfortunate Hebrews whose presence is supposed to defile or detract in some way from the sanctity of the Empire. A feeling of this kind may be very well for a member of the Holy Synod, but for the ordinary worldling of the Ignatieff type the hatred towards the Jews can only be ascribed to some lower passion like jealousy. Such is the tenacity, industry, and sobriety of the despised Hebrew, in spite of the utmost efforts of the powers that be to squeeze him out of existence, that

wherever he has a fair chance there is a probability of his rising above the average Russian.

The commerce and trade of every town from which the Jews have been expelled have suffered in consequence. The business transacted at the great annual fair at Nizhni Novgorod has fallen to such an extent that Russian merchants have been obliged to protest against the laws directed against the oppressed people. It is the same at Moscow and Odessa. When the Jews were driven from these great commercial centres the rate of interest on loans rose from 25% to 200%; for everywhere they are ready to lend at a lower rate than the Russian *Kulaks*, or small money-lenders.

Two or three centuries ago the position of the Jews in Russia was not at all unfavourable, and up to 1882 was generally tolerable. But since May of that year it has become intolerable. By the May laws they were forbidden to settle outside the towns in the Pale of Settlement, or to acquire landed property, or to carry on business on Sundays and holidays. Places that had previously been known as towns were suddenly ordered to be termed villages, as an excuse for expelling them. Suburbs of large towns were treated in the same way for a like reason. This, of course, has caused an immense congestion of the poorest Jews within very narrow limits, and is a fruitful source of endemic disease. They are besides oppressed in a number of ways. They have to pay a tax on their religious observances, on the candles they burn on certain festivals, even on the head-covering they wear while repeating their prayers. They are not permitted to receive treatment at the public hospitals, or to make use of the educational institutions, Polytechnics, and Normal Schools they have founded with their own money. They have to pay higher taxes than other people, and yet receive the treatment of dogs from every official. In the army they are grossly maltreated, though they have fought well in face of the enemy. Then the sentences of expulsion were carried out with the utmost ruthlessness, sometimes in mid-winter, while no exceptions were made for the old and infirm, or for women on the point of becoming mothers.

The story of these persecutions is told in dispassionate language, and in such a sober, philosophical, and unresentful spirit, that although it is in the nature of an *ex parte* statement, we are forced to believe it is only too true.

Carle Lefèvre-Pontalis. De Tiflis à Persépolis. Paris: Librairie Plon, N.D. Pp. 98. With 88 Illustrations.

This is the record of what can only be termed a scamper from Tiflis to Persepolis and back to Baku in the very short space of forty-two days, from February 9 to March 22. Having missed the train from Tiflis eastwards with the connection to Resht, the author, in order to reach Teheran, had to use the post road *viâ* Erivan and Tabriz. The cold and snow were a great hindrance, and the bare, treeless landscape had a forbidding aspect. After a very short stay of three days at the capital, during which time he obtained an audience with the Shah, he was obliged to resume his ride on the miserable post horses of the country till he reached his destination. After a hurried visit to the ruins of Persepolis and a couple of days at Ispahan, he had to retrace his steps with the utmost speed. What the author has to say is put in a pithy form, and the annoyances, discomforts, fatigues, and dangers of the road are passed over in a summary manner. In one place, owing to his indiscretion, he was nearly murdered by a pack of furious stablemen. The most attractive part of the book is the illustrations, to the number of eighty-eight, made from photographs and reproduced by a zincographic or such-like process.

Au Pays des Osmanlis. Par G. des Godins de Souhesmes. Paris: Victor Havard, 1894. Pp. 400. *Price* 3 *fr.* 50 *c.*

After a long residence in Turkey, the author relates his experiences there with an independence and vivacity which, as he himself admits, will occasion "sans doute bien des colères." The chapter on the European colonies of Constantinople is fresh and interesting; and from it we learn that the French and Austro-Hungarian colonies are in a state of decay, the German colony is all-powerful, the American is rising, the English is self-important, the Italian is poor, the Polish is industrious and the Russian is very influential. Our author's description of the American and English colonies is amusing. "The Bible in one hand," he says, "a box of samples in the other, the American proceeds slowly, gravely, methodically." He is everywhere in evidence, and seems "likely to acquire commercial preponderance, after having secured a marked political and religious influence." The most splendid American institution in Constantinople is the "Roberts' College," founded thirty years ago by a wealthy American for the purpose of affording education to the young of all nationalities.

As for the English in Constantinople, the author cannot sufficiently express his dislike of them. "Scornful pride, imperturbable coolness, thorough belief in themselves, haughty and provoking manners (as if each of those islanders carried on his feet a bit of Old England), perpetual menace of word or look, swaggering airs, arrogant ways, looking down on the French as a ridiculous people, brutal knaves, hypocritical politically as well as privately,"—certainly, the picture our author draws is an alarming one, and shows that he must have mixed in very bad English society in Constantinople. Of course, the Russians are the very opposite of the wicked English. "Generally modest, simple, sweet-tempered, amiable, they were easy of access and of extremely agreeable manners." How tired the Russians must be of those French *éloges*!

La Rome d'aujourdhui. Par Henri Joly. Paris: E. Dentu, 1894. Pp. 265. *Price* 3 *fr.* 50 *c.*

A portion of this volume appeared during 1894 in the literary supplement of the Paris *Figaro*, a sufficient guarantee of the literary eminence of its author. Among the many subjects he treats of, we note that crime at Rome is much more common than one would imagine. "The Italian capital," says M. Joly, according to the Italian statistics of 1894, "holds the first place for assaults, and for resistance to, and outrages on, the authorities. In fact, in total crime it is only surpassed by Leghorn." Perhaps the reformatories for juvenile offenders explain best the violent spirit which lurks in many Italians. M. Joly visited one of these near Rome, and, as he was passing a cell, a boy twelve years old handed him a paper on which was written, "Death to the King! Death to the Pope! Death to all the Bourgeois!" No wonder that anarchists and criminals issue from this reformatory.

On 2nd April 1894, M. Joly had an interview with the Pope, detailed in this volume. Author of a book entitled *Le Socialisme Chrétien*, M. Joly informed the Pope that "in the Christian Church Socialism has never been represented except by heresies," to which the Pope made no reply. He afterwards urged the Pope to use his authority with the French Government to obtain for France the right of free public assembly, a right only enjoyed at present by professional syndicates and financial speculators. M. Joly also interviewed Signor Crispi, of whom he remarks that "when his eyes lit up above the thick bristles of his white moustache, one saw the old revolutionist at once."

Ein Ausflug nach Macedonien. Besuch der deutschen Eisenbahn von Salonik nach Monastir. Von Colmar Freiherr von der Goltz. Berlin: Deckers Verlag, 1894. Pp. 154, and a Map.

The author begins by giving an account of his visit in May 1893 to Salonica, followed by an excursion to Pella, which proved rather disappointing from an archæological point of view. Then comes a long historical excursus. The next chapter describes his ride along the unfinished part of the line as far as Monastir, in company with various engineers. The natural obstacles are considerable, but all seem to have been overcome with great skill. In the last chapter the chances of a successful future for the new line of railway are discussed, and pronounced to be good. In course of time it will be prolonged to the Adriatic, either to Durazzo or Avlona, though such an event does not lie in the immediate future. A brief summary of the history of the interesting valley district of Meglen, north of Vodena and north-west of Salonica, inhabited by Vlachs, Turks, and Bulgarians, is given. But no mention is made in the brief bibliography at the end of Dr. G. Weigand's *Vlachs-Meglen*, an ethnographical and philological investigation published at Leipzig in 1892—a small work which is well deserving of notice.

The Story of the Expansion of Southern Africa. By the Hon. A. Wilmot, Member of the Legislative Council of Cape Colony. London: T. Fisher Unwin, 1894. Pp. xxviii + 290. *Price* 5*s.*

Rhodesia of To-Day. A Description of the Present Condition and the Prospects of Matabeleland and Mashonaland. By E. F. Knight, recently Correspondent for *The Times* in the British South Africa Company's Territory. London: Longmans, Green, and Co., 1893. Pp. 151. *Price* 2*s.* 6*d.*

The literature of Southern Africa becomes overwhelming—so much so, that it is hard work to keep pace with it. If the volume of the literature is a true index of the progress of the country, that progress must be extraordinarily rapid—as no doubt it has been, owing not only to the discoveries of gold and diamonds, but also to the development of the agricultural and pastoral resources of the highly favoured region. It is both useful and interesting, therefore, to recall the early history of the Dutch and the British settlements at the Cape, not forgetting the elements of romance and adventure which it contains. That is what has been attempted by the Hon. A. Wilmot in his *Story of the Expansion of Southern Africa*. Mr. Wilmot's position as a member of the Legislative Council of Cape Colony imparts to his story a certain official authority. He shows, also, a very sound appreciation of the difficulties of the problem with which he has to deal. He says, very truly, in his preface, that "it is impossible to study thoroughly recent events in one part of South Africa, or developments in any portion of the congerie (?) of states and colonies into which its vast territories are divided, without understanding the subject of its history from the earliest times." The author has, therefore, undertaken a systematic history of the settlement of Cape Colony, of the events which resulted in its transference to the British Crown, and of subsequent events. The book cannot be commended on account of its literary qualities, but it has value as a record of facts and as an exposition of political complications. It is accompanied by an excellent map, by Philip and Son of Liverpool.

Mr. Knight's work is strong in those respects in which Mr. Wilmot's is weak. It possesses the qualities of brilliancy and force which characterised the letters of the *Times* Correspondent reprinted about a year ago. This book is not a systematic history. It deals with specific subjects, such as native labour, climate, grazing and agriculture, the Chartered Company's goldfields, and administration—the object

being to set forth, for the benefit of intending emigrants, the conditions that will be met with in Matabeleland and Mashonaland. Another work is promised giving the history of the Chartered Company's enterprise. There is a good sketch-map of the territories.

Glimpses of Old Glasgow. By Andrew Aird. Glasgow : Aird and Coghill, 1894. Pp. 464.

Mr. Aird's graphic reminiscences of Old Glasgow, which he modestly entitles "Glimpses," have special interest for the citizens of that great city, and will no doubt be of great value to its future historians. His chief object is to exhibit and illustrate the marvellous growth and expansion which it has undergone within his own recollection—which goes back, however, for upwards of sixty years. Separate sections are devoted to such subjects as the University, the Cathedral, the suburbs, shipbuilding and engineering, the water supply, savings banks, the bridges, educational progress, and public libraries. Fully one-half of the volume is devoted to brief biographical notices of prominent citizens.

How to live in Tropical Africa : A Guide to Tropical Hygiene. By J. Murray, M.D. London : George Philip and Son, 1895. Pp. 252, and numerous Illustrations, Maps, and Climatological Memoranda by E. S. Ravenstein, F.R.G.S. *Price* 5*s.*

Impressed with the importance of understanding how to live in Tropical Africa, and with the loss of life which results from the too common ignorance of explorers, traders, and would-be settlers, Dr. J. Murray, in the work before us, undertakes the office of guide, philosopher, and friend, and has produced a volume which *must* be in the hands of every one proceeding to Africa in search of either adventure or wealth, or those who go from a higher motive, namely, to spread the light of civilisation in that dark land.

The book is admirably conceived and well carried out, and we can with confidence assert that, within the limits in which the author writes, it is the best book on the subject which exists in English, or, indeed, in any other language. The only books which compare with it are Kohlstock's *Ärztlicher Ratgeber für Ostafrika*, published in 1891, and an older book, *Guide hygiénique et medical du Voyageur dans l'Afrique Centrale*, par MM. Drs. Nicolas, La Caze et Signol, 1885 ; but these books go somewhat beyond our author, as they deal with a large number of diseases, whilst he confines his information to the medical climatology of Africa, to the great subject of malaria, its cause, prevention, and treatment, to food, drink, clothing, and the tent and house problem in Tropical Africa. We cannot call attention to all the good points in Dr. Murray's book, nor is it needful to do so, as its careful study is necessary for every one going to Africa.

We may say that the medical climatology of Tropical Africa is fully dealt with in a clear, concise manner, and, as Mr. E. G. Ravenstein has aided in this part of the work and has provided four maps to illustrate it, it may be taken as quite up to date and perfectly accurate.

Chapter III. deals with the *habitat* of malaria, and climate in relation to it ; full information is given as to the effect of heat, damp, soil, altitude and vegetation upon its production. The author should, however, refer to wind and water-borne malaria.

Chapter IV. deals with the selection of healthy lands and building sites, and other precautionary measures against malaria ; it is full of sound advice, and crisp rules are given, such as : "Select a spot with hills lying to the windward, on

the rainy side," which will serve to fix the attention on the vital points to be rigidly observed.

Chapter v., dealing with personal precautions against malaria, should be learnt by heart by the intending resident in Africa.

Chapters vi. and vii. are technical, and, although of interest to the medical man, need not delay us.

The chapters on the various types of malarial fever and their treatment are very good. If the rules given are followed with common sense, much can be done even by the layman to combat or cure the fevers ; and to young doctors, fresh from college, the information they contain, based on practical experience as well as on scientific knowledge, will prove of great value.

The chapters on food, drink, clothing, and dwellings are full of sound advice, and a reason is given for that advice. Our limits of space prevent further details, but we congratulate Dr. Murray on his book, and are certain that every one who will study it will find in it a mine of wealth. It is worth its weight in gold.

On the Geographical Distribution of Tropical Diseases in Africa. With an Appendix on a New Method of illustrating the Geographical Distribution of Disease. By R. W. Felkin, M.D., F.R.S.E., F.R.G.S. With Table and Map. Edinburgh : William F. Clay, 1895. Pp. 79.

This treatise, now published in book form, was originally written at the request of the African Ethnographical Congress, held at Chicago in 1893, and was afterwards published in the *Proceedings of the Royal Physical Society*. In the introductory chapter the author gives a sketch of the physical configuration of the continent of Africa, and of the conditions which modify the prevalence of disease, such as rainfall, winds, elevation, temperature, etc. He then examines the prevalence, treatment, etc., of the various diseases, dividing the continent, for this purpose, into eight regions. The comparative healthiness, or unhealthiness, of each region is here ascribed to its climatological and other local causes, and prophylactic and curative measures are recommended.

The book is not solely a scientific work, but is one that should be procured by every visitor to, or resident in, Africa ; for, as Dr. Felkin points out, the high death-rate among Europeans in such ill-famed regions as the West African coast is in great measure due to "want of a knowledge of the precautions necessary for a residence there, and, unfortunately, in many cases, to the wilful ignoring of prophylactic measures and of a well-ordered life."

In conclusion, the author expresses his opinion that "the progress of medicine and hygiene will, before long, conquer most of the obstacles to the civilisation of that continent."

The map and table appended to the work are worthy of special mention. On the former the distribution of each disease is indicated by a special sign, repeated twice or thrice where the intensity is more marked ; while malaria, the most widespread scourge of Africa, is shown by red tints. Furthermore, by noticing the figures representing the temperature, humidity, and elevation, we may obtain some notion of the relation of physical causes to the prevalence of a disease in any given district. Thus the emigrant to any part of Africa can see at a glance to what dangers he will be exposed. Scarcely less useful is the table, where the intensity of each disease is marked by one, two, or three asterisks. By running the eye down a vertical column, the diseases of a region and their intensity may be quickly learnt, and from a horizontal column may be ascertained the districts where any particular disease prevails.

Zeitschrift fur Afrikanische und Oceanische Sprachen. Mit besonderer Berücksichtigung der Deutschen Kolonien. Herausgegeben mit Unterstützung der Kolonial-Abtheilung des Auswärtigen Amts, der Deutschen Kolonialgesellschaft u. A., von A. Seidel. 1. Jahrgang, 1 Heft. Berlin: Geographische Verlagshandlung Dietrich Reimer (Hoefer und Vohsen), 1895. Pp. 96.

This new quarterly is intended to take the place held for a short time by the *Zeitschrift für Afrikanische Sprachen*. It is intended to focus all information procurable with reference to the dialects spoken in German Africa. Folklore is also to find a place in its pages, so as to show the state of mental development possessed by the natives in the German colonies.

Such a magazine is likely to fill a niche in the fabric of African exploration, and we heartily wish it all success. The names of Beneke, Needham Cust, Professor W. Grube, Merensky, Professor Fr. Müller, G. Schweinfurth, and others who are associated in its production are sufficient guarantee of its scientific value. The first number of the magazine contains papers by J. G. Christaller, A. Seidel, and W. Grube, and is well worth the attention of all interested in African dialects.

Histoire du Monde: Son Evolution et sa Civilisation. Par Étienne Guyard. Paris: Chez l'Auteur, 5 Impasse Nicole, 1894. Pp. xi + 689.

This rather ambitious volume is printed with the beginning at what, with us, is usually the end. In a characteristic "Postface" the author gives reasons for thus copying the example of the 550 millions of Eastern Asia, instead of slavishly following the lead of the 450 millions of Europe and America. We may be pardoned for considering these reasons to be largely fanciful, and the accompanying eulogy of things Chinese to be rather strained. The aim of the author is to give an epitome of the natural history of our earth; and the book is avowedly eclectic. The geological succession is displayed in the conventional stratifications, the typical fauna and flora of each system being added; and the evolution of plants and animals is shown in diagrammatic "trees," whose simplicity is probably their least scientific feature. The accompanying letterpress is largely a catalogue or classification of fish, flesh, and fowl, with descriptions too condensed to be of much service to either the ignorant or wise. At the same time, certain sections of the book are speculative and imaginative to a degree; and it is difficult occasionally to know whether the author is rehearsing the opinions of others or favouring us with his own views. For example, we readily admit that our sun was probably, in former periods, much more extensive than it is now, but we have yet to find reason or authority for the statement that our earth was of smaller dimensions in the earlier geological times (see pp. 98, 102). On page 18 there is a sketch of the "curve described by the moon about the terrestrial orbit during one of its revolutions." M. Guyard here ingenuously displays his ignorance of astronomical fact, for the moon's orbit is never convex towards the sun. There is much entertaining reading in the book; and the author has taken great pains to give a broad outline of the evolution hypothesis in its most thoroughgoing materialistic form. But we recommend for its perusal a sober, critical scepticism. The title-page is ornamented with a balance, whose one scale-pan is packed with volumes of scientific lore, and is yet far outweighed by the comparatively flimsy *Histoire du Monde* resting in the other!

A Descriptive Dictionary of British Malaya. By N. B. Dennys, Ph.D., Author of the *Folklore of China*. London: London and China Telegraph Office, 1894. Pp. v + 423.

"The original intention of the compiler of this work was to make arrangements for re-editing Crawfurd's valuable *Descriptive Dictionary of the Indian Archipelago*.

It was, however, found that to do this in conformity with the plan adopted would be for various reasons impracticable, and the following pages deal only with that portion of Malaya lying within the sphere of British influence."

This is how the editor, or, as he prefers more correctly to entitle himself, the compiler, of this book begins his preface. We think it a pity he did not cut himself altogether adrift from his predecessor, and put together his materials in a more scientific fashion. Dr. Dennys does not arrange the information he imparts according to the usual methods of encyclopædists; and where he deviates from their canons, he deviates, in our humble opinion, not for the better. For instance, he places the various cases of *bukit* (hill), *gunong* (mountain), *pulo* (island), and the like generic terms under those headings, not under their several specific names, followed by the generic term; which is exactly as if one were to put the River Thames, River Severn, River Clyde, under R., instead of under T, S, and C respectively. Similarly, we have Black Leopard under B, and Wild Boar under W. Then there are articles like Camel, Amber, Ass, which are totally useless; they are merely inserted to tell the reader that these several things do *not* exist in British Malaya, and consequently have no pretext for being included in the present book —entirely apart from the fact that no information is given under them. There are also articles which possess a merely ephemeral and local interest, *e.g.* estates, and their owners, etc.; and the same remark applies to an appreciable amount of the facts stated throughout the book. Amongst other eccentricities of arrangement we have noticed article Brooch (sing.), but *Brooms* (plur.), and the more familiar Babiroussa spelt Babi rusa. We have one other fault to find. In the account of the larger and more important places, states, provinces, etc., the sections are placed in a most illogical succession; for instance, the History is sandwiched between Position and Geology, and Rivers, Mountains, and Climate come between sections on Government and Public Buildings.

But when we turn from the editorial work of arrrangement to the subject-matter, we change our note from blame to praise. The geographical articles are on the whole carefully done, and contain much useful information; that on Kedah being a model of what such an article ought to be in a work of this description and scope. The articles in the departments of the flora and fauna are amongst the best written in the volume, clear, succinct, and readable. Another feature that deserves the warmest commendation is the copious bibliographical equipment, references of this nature being plentifully sprinkled through the pages. An excellent article is concerned with the curious and little understood disease, if disease it can be called, of *latah*. But surely a more adequate account was called for on the influence of the Arabs upon the Malays. And why are no commercial statistics given, *e.g.* under Singapore? Dr. Dennys avers the fact of the existence of breeding pearls, and cites circumstantial evidence in support of his contention, as against the contradictory statements of scientific authorities. He also asserts that the usually accepted derivation of Singapore, from Sanskrit *singa*, "lion," and *pura*, "city," is incorrect; it is really derived, he says, from *singha*, "a place of call," and *pura*, a "city." If this book were judiciously pruned, and a good deal of its information rearranged in accordance with the usual practices of encyclopædias, it would be a good little work, and its usefulness much enhanced. The printer's work is well done.

The Argus Annual and South African Gazetteer, 1895. Johannesburg, Cape Town, Pretoria, and London: The Argus Printing and Publishing Co., Ltd. Pp. 556. *Price* 3*s*.

As our colonial possessions increase in population, wealth, and importance, the handbooks treating of their state and history become annually more bulky, until

they frequently assume a size that makes them unwieldy to handle and, without an exceptionally good index, often difficult to consult. The publishers of the standard reference book on South Africa have appreciated this, and have now split their yearly volume into two parts—the *Annual and Gazetteer*, which is before us, and the *Directory*, which is to follow. There is a very distinct gain by this improvement, the book being handy in size and not overcrowded. So far as we have examined the varied contents, they appear to be accurate and brought well down to date. Under the details of education we miss a list of the professors in the Cape Town University. Such a list would be more useful than the long catalogue of graduates, and we hope that it may be added in future editions.

Ancient Rome and its Neighbourhood. An Illustrated Handbook to the Ruins in the City and Campagna. By Robert Burn, M.A., Fellow of Trinity College, Cambridge, Author of *Rome and the Campagna*, *Old Rome*, *Roman Literature in Relation to Roman Art*, etc. London: George Bell and Sons, 1895. Pp. xiii + 292.

Mr. Burn has abundantly proved by his previous larger works on Rome and the Campagna that he has a thorough knowledge of the subject, and is competent to handle it in a scholarly manner. Working on the basis of these, and including the latest discoveries, he has now produced an excellent handbook to the relics of the Ancient City. He has not thought fit to include the Catacombs amongst the objects he notices (though he might not inappropriately have done so), but otherwise his list is exhaustive. For the traveller interested in the ruins (and who that visits Rome is not?), who does not wish the minute detail of historical and technical information to be found in Middleton's bulky volumes, a better guide does not exist. It is handy in form, clear and terse in style, as full as most travellers will require, and free from superfluous matter. Maps, plans, and illustrations are numerous, and at the same time good and useful. In regard to buildings the real nature of which is disputed, Mr. Burn is commendably cautious and judicious, stating the evidence for the view he holds, but refraining from dogmatic assertion when evidence is not forthcoming. We observe that he does not appear to accept the distinction between the Regia and the Domus Publica in the Forum on which Middleton strongly insists, and for which he produces what seems convincing evidence. We think also that Mr. Burn might have stated even more strongly than he has done the grounds, furnished by recent discoveries, for holding that the circular Pantheon with its dome, is really a work of the time of Hadrian, and replaced the quadrangular temple built by Agrippa.

After Five Years in India; or, Life and Work in a Punjaub District. By Anne C. Wilson. London: Blackie and Son, 1895. Pp. 312. With Illustrations. *Price* 6*s.*

How the two hundred and fifty Scottish, English, and Irish Competition-Wallas who administer the two hundred and fifty districts of British India, each with an average population of a million of human beings, do their daily work, is here told by Mrs. Wilson. In style she has all the brightness of her father, the late Rev. Dr. Norman MacLeod, who, after his visit to India, was taken away all too soon for the good of its people. It is pleasant to find his aims and his spirit thus reproduced so worthily. The volume should be read by all who care to know how India is successfully governed and civilised by a handful of white rulers, of whom, at present, Lord Elgin is the chief.

NEW MAPS.

WORLD.

L'ANNÉE CARTOGRAFIQUE. Supplément Annuel à toutes les Publications de Géographie et de Cartographie dressé et redigé sous la direction de F. Schrader. Quatrième Supplément. *Price 2 frs.*

Paris: Librairie Hachette et Cie., 1894.

The issue for 1893 contains two sheets of maps with explanatory letterpress. As usual, the greatest changes and most explorations have taken place in Africa. The large map of Madagascar, on the scale 1 : 5,000,000, according to the latest discoveries, deserves special mention. The map also of Minas Geraes, after J. Chrockatt de Sà, contains much that is new. Itineraries of travellers in Africa and Central Asia are also given.

AFRICA.

CENTRAL AND SOUTH AFRICA, Bartholomew's New Map of ——, 1895.

The former edition of this map was issued last year, and therefore the changes are, for Africa, comparatively few in number. Some of them are, however, important, as the new boundary of the Congo State along the Mbomu river, the western boundary of the Nyassaland Protectorate, and the recently delimitated southern boundary of the Congo State. Several minor details have also been added.

FOGO, Carta da Ilha do —— (Cabo Verde), 1894. Escala, 1 : 100,000.

Presented by the *Commissão de Cartographia, Lisboa.*

MASHONALAND AND MANIKA, Map of ——, including the Lowlands, to the Zambezi and Beira. Based upon surveys made by F. C. Selous and other available authorities. Scale, 1 : 1,000,000. *The Geographical Journal, Jan.* 1895.

BRITISH CENTRAL AFRICA PROTECTORATE, Map of the ——. Prepared from a drawing compiled at the Intelligence Division, War Office, for H. H. Johnston, C.B., H.M. Commissioner and Consul-General, B.C.A. Scale, 1 : 1,500,000 or 1 inch = 24 miles. *The Geographical Journal, March* 1895.

ATLASES.

NEUER HANDATLAS über alle Teile der Erde in 59 Haupt- und 120 Nebenkarten mit alphabetischen Namenverzeichnissen. Herausgegeben von E. Debes. Ausgeführt in der Geographischen Anstalt der Verlagshandlung.

Leipzig: H. Wagner und E. Debes.

The early parts of this new Handatlas, which is now completed, were favourably noticed in this Magazine in Vol. x. page 56, and the good opinion then expressed has been fully justified by the later sheets. The author and his publishers have kept their promises; the whole work has been executed with the greatest care, and the latest available data of Physical and Topographical Geography have been gathered together with praiseworthy thoroughness, so as to produce an atlas which will always rank among the best hitherto published. It contains 59 maps and 120 insets, an index to each of the maps, and letterpress accompanying the meteorological charts, by Professor van Bebber and Professor Köppen.

Numerous maps are given showing railways and telegraphs, rainfall, population, and other meteorological and ethnographical phenomena, etc. The topographical maps are clear and full of detail, and are on large scales for a general atlas, the sheets of Germany being on the scale of 1 : 1,000,000, or about 16 miles to an inch. Africa is fully represented by a general and five special maps, in which the latest changes are recorded. We cannot, however, conceive why the whole of the British Possessions, from the boundary Cape Colony to Lake Tanganika, is styled British Central Africa. The general maps of America should have been drawn on the same scale. We notice also the old mistake of naming the State *San* Salvador instead of simply Salvador. These are, however, small points, and can easily be rectified in a new edition, which will, we hope, soon be required, for the Atlas is thoroughly good and reliable.

PHILIP'S HANDY ATLAS OF THE COUNTIES OF ENGLAND. *Price, cloth, 5s.; French morocco, gilt edges, 7s. 6d.* *London: George Philip and Son.*

A new and enlarged edition of a useful Atlas. Several new maps have been added, including the county of London, environs of Liverpool and Manchester, the Yorkshire manufacturing districts, and the Tyne ports and Black Country. It is also claimed that every railway station in the country appears on the maps and in the large and exhaustive index. Besides, there are maps of North and South Wales, the Channel Islands, and the Isle of Man. The sheets are pleasingly tinted and clearly printed. Altogether an excellent production.

THE CASTLE LINE ATLAS OF SOUTH AFRICA: A Series of 16 Plates printed in Colours, containing 30 Maps and Diagrams. *Price 3s. 6d.*
London: Donald Currie and Co., 1895.

This Atlas has been issued by Messrs. Donald Currie and Co., the owners of the well-known "Castle" line of Royal Mail ships, for the information of intending emigrants to South Africa. Though somewhat old-fashioned in style, the maps are bold and striking, and are well up to date, and full in their details. The plans of the great goldfields are specially valuable and interesting. Prefixed to the maps, there are seven chapters descriptive of the country—its character, its climate, its resources, its peoples, and its history. Appended to the volume there is an Alphabetical Index, containing 6000 names, with references to the maps.

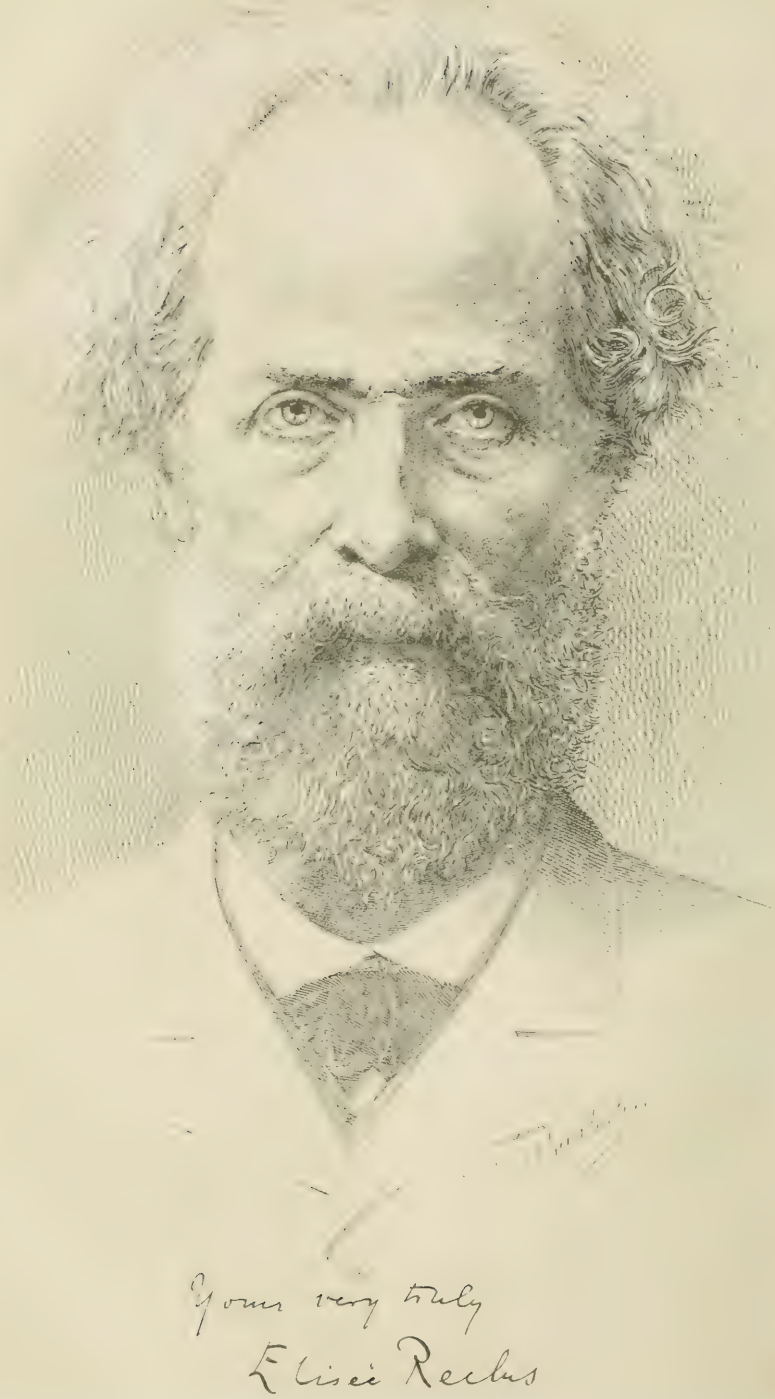
NEW CHARTS.

BAHIA DE BAYARUTO, Reconhecimento Hydrographico da, 1894. Escala, 1:200,000.

LIMPOPO, Reconhecimento da Barra do ——, 1894. Escala em metros, 1 : 5000.

FURNA, Planta hydrographica do Porto do —— (Ilha Brava), 1894. Escala, 1:2000.

Presented by the *Commissão de Cartographia, Lisboa.*



Yours very truly
Elisée Reclus

By permission of Messrs. [illegible] the publishers of the english edition

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

MANCHURIA.

By the Rev. JOHN ROSS, D.D.

(With a Map.)

THE name Manchuria is a purely geographical term, and is unknown to both Chinese and Manchus. There was a kingdom of Manchu established three centuries ago, in a beautiful valley seventy miles to the east of the present Mukden, which gradually extended its sway over its smaller neighbours till it embraced all the country between Kaiyuen and the sea, and from the Yalu river on the east to the Liao on the west. It also included the southern portion of what is now known as the Russian Maritime Province to the north of Korea.

The word Manchu is translated *Tsing* or *Ching* in Chinese. It was adopted as a dynastic title by the young founder of the present Imperial House of China while his kingdom was yet in its embryonic state. The title, which means the bright "clearness" of water, was most probably suggested by that of the then reigning Chinese dynasty, the *Ming*, which signifies the "brightness" of light.

The country which we designate Manchuria is called by the Chinese *Kuantung*, or "East of the Barrier," in reference to Shanhaikuan; and also *Tung Sanshung*, or the "Three Eastern Provinces." These three are *Fungiten* on the south, *Kirin* in the centre, and *Heilungkiang* in the north. This last is known to us as *Chichihar*, the name of its capital. The name *Fungiten*, or the "Ordained of Heaven," was given to Southern Manchuria after the Manchus became rulers of China, and with reference to that event. Throughout the course of Chinese history, up to the reign of the present dynasty, it was divided into two provinces. The portion of it east of the river Liao was called *Liaotung*, and the long, narrow portion to the west of the river *Liaosi*. These names are of frequent occurrence in the general history of China. The Chinese designation of Kirin is *Chuan Chang*, or "The Arsenal." This arsenal was founded by Kanghi to

oppose the Russians, who were then south of the Amur. *Heilungkiang*, or the "Black-Dragon-River," is the Chinese equivalent of the Manchu Saghalien Wula, *Saghalien* signifying "Black," and *Wula* "Water." These are the names by which the Amur river is known; as the Amur, neither Chinese nor Manchus know it.

Physical Characteristics.

From the Port of Newchwang, or Yingkou, as the Chinese call it, a magnificent plain stretches away north-east to the Amur. An occasional hill or hillock breaks its monotony at long intervals; but it is virtually an unbroken plain of rich arable soil. The few hills which interrupt the dead uniformity have such gentle slopes that they are all cultivated in the southern and central provinces. The main road from the port runs through this plain to the east of the Liao river, and is usually not far distant from the first ranges of the eastern hills. But from many square miles of this plain it is impossible to see a hill in any direction. This great plain produces luxuriant crops, the soil being remarkably rich, and the Chinese farmers utilising it to the utmost. The large cities, the centres of government and of commerce, lie mostly along this main road. The other cities, towns, and villages which crowd the plain are connected by a network of innumerable roads. On the west the plain is bounded by the hills of Mongolia, which rise, one range above another, till they culminate in the great Mongolian plateau. The east of the plain is skirted by mountain ranges, usually low and tame. These succeed each other like great motionless waves from the plain to the Sea of Japan.

The general trend of these mountains is north-east and south-west. Occasionally a range occurs cutting across the common direction, and here is to be found the most picturesque scenery. One notable example is the double range south of Liaoyang, called the Chienshan, or "The Thousand Peaks." At their highest points these mountains rise about 2000 feet above the stream which runs at their base. The range intersects the lower and tamer ridges around almost at right angles. At the east end there is a narrow opening through which runs the mountain torrent, fed from the inner sides of the range; the west end is closed in. These Peaks attract the eye at a great distance, their numerous and sharply serrated ridges causing them to stand out prominently from the other hills around. But, on entering by the east end, the eye is enchanted by the rich beauty of the vegetation and the grandeur of the mountains. I have called it a double range; for, though throughout its greatest extent there are two distinct ranges, they are completely merged into one at the west end. The inner bases of the two lines of hills are divided only by the stream which ever flows between. These two lines rise up facing each other with sides so precipitous that they are often composed of naked perpendicular rock. But wherever a tree can grow, wherever a bush can hang, wherever a flower can lay hold, or a creeper cling, there you find vegetation, whose rich growth vies with that of the tropics, crowding every inch of soil, or peeping out of every rocky cranny. It would be difficult anywhere to discover a limited area as rich botanically

as the five or six miles of gully running up this curious range and the numerous short offshoots from the main line.

Every notable mountain in Manchuria has one or more monasteries; but the Thousand Peaks have for five centuries been specially crowded. Buddhist and Taoist vie with each other. The Buddhist monasteries are the more splendid; the Taoist the more numerous. Each occupies a commanding site. Some are particularly imposing, the foundation of one set of buildings standing above the roof of another. A few of these trace back their existence for fully a thousand years.

Another pile of mountains, celebrated for their grandeur and for the beauty and rich variety of their vegetation, is situated near the large city of Kinchou, on the west of the Liao. These mountains are not only the habitat of equally numerous, and of at least one more splendid monastery, but boast the additional distinction of having been the burying-ground of a former Imperial family—the Liao dynasty of China.

The highest mountain in Manchuria is what is called the "Long," or "Ever-White Mountain," in the remote north-east. By the travellers, Messrs. James and Younghusband, who ascended this peculiar mountain, its height was found to be 8000 feet. Its general form is circular, the inner side of its very steep crown enclosing a deep pool or lake of water. This was probably the crater of an immense and long extinct volcano. The upper ridges of this mountain are of pumice. Seen from a distance, it has the appearance of being covered with snow. Many people, both Chinese and Europeans, have inferred from its appearance and its name of the "Ever-White," that it was clad in everlasting snow, but the best Chinese authors, however, always speak of white stone. The pumice is carried down several hundred miles by the waters of the Yalu, exciting the astonishment of the Chinese and Koreans by floating on water.

Considering the short distance intervening between Manchuria and Japan—where earthquakes are of almost daily occurrence, and frequently of a destructive nature—it is curious that earthquakes are of such rare occurrence in Manchuria. Throughout an experience of twenty-two years I have known of only three slight shocks. The first, which came from the north-west, and ran at right angles to the mountain ranges, was accompanied by a rumbling sound similar to that made by a train passing over a bridge in the distance. But if rare in modern times, there is every indication that in the remote past earthquakes were severe and volcanoes active. Around the city of Kuantien, about one hundred miles east of Liaoyang, great blocks of lava, or "pock-mark stone," as the Chinese call it, lie in every direction. Sometimes they rest on the ground; some are half hidden; but most are entirely buried underneath the soil. One overhanging bank of a small river west of Kuantien is wholly composed of black lava, which also forms the bed of the stream. The foundations of the stronghold of Kuantien were built of it by the last Chinese dynasty. Further north, not far from Ninguta, is an extensive field of lava. So entirely has it taken possession of that region, that in treading over it every step produces a hollow sound, as if walking over a baker's oven or other hollow underneath the ground.

Among these Manchurian mountains the geologist would find many

varieties of rock. Laminated rock is not common. Only one range of schistose, laminated rock have I seen. A coarse white marble is sufficiently common, and throughout the southern province is burnt for lime. A black lime is also found there, and is in general use for pointing the brick buildings and tiled roofs of the Chinese. Quartz occurs here and there all over the east; and not a few varieties of quartzite are cut into ornamental articles of numerous forms. In the neighbourhood of Siuyen, sixty miles east of Newchwang, great blocks are quarried out of the bed of the river Yang. This stone is of a creamy white colour, streaked or irregularly patched over with a light green. In Siuyen and Mukden there are many workers in this stone; while it is largely exported to other parts of China. The articles made of it are called false jade, from their close resemblance to that more precious stone. Agate is common in the Amur, and finds its way thence all over the country. On one occasion, in a lovely region of Eastern Manchuria, I came across a range of hills wholly composed of a remarkable conglomerate. The matrix was as hard as the pebbles of various kinds and colours embedded in it. The Chinese there cut pieces of this stone into balls, and give them a polish equal to that of granite. Gneiss is not uncommon. But basalt, and especially granite, are by far the most common. Basalt is more frequently seen after penetrating pretty deeply into the mountain ranges. Bordering the plain the most frequent rock is granite. To the east of the plain this granite is white or Aberdeen granite. To the west of Kinchou, on the way to Shanhaihuan, I came across extensive regions of red granite.

The rivers of Manchuria flow in the same general direction as the mountains lie; though they sometimes cross the mountain lines at various angles, taking advantage of faults in the continuity of the mountain chains. The Ever-White Mountain is the centre of the watershed. Thence the Usuri flows directly north, forming the boundary between Manchuria and the Maritime Province of Russia. The more important Songari is formed by many affluents from the north-west flanks of the White Mountain. Passing Kirin it is a splendid river; its chief use at present, however, being to carry countless logs of timber cut down on the slopes of the mountain ranges north of the White Mountain. Beyond Kirin it is joined by the Nonni from the great northern range of Hinganling. The united then runs thereafter in a north-easterly direction, passing several important cities on its way to the Amur. The confluence with the Nonni forms a wide expanse of water, where countless fish of all sizes are caught in the autumn and forwarded in a frozen condition to all the towns of Manchuria, and even as far as Peking. Commercially the river is of little service, and is likely to remain so, as the Russians have excluded the Chinese from the navigation of the Amur. Some years ago a small Russian steamer went up the Songari to Kirin.

The Yalu or Yaloo flows west and south-west from the White Mountain, separating Korea from Manchuria along its whole course. It is a beautiful river, its waters being, like those of the Songari, clear as crystal. Both rivers flow over stones and among mountains. The Yalu is mainly useful in floating down immense rafts of wood, which find their way from the town of Antung, at the mouth of the river, to the port of

Newchwang, and to Chefoo and Tientsin for the provinces of Shantung and Chihli. The magnificent forests along its banks have disappeared. Its tributaries are now called upon to yield the fine logs of wood which form endless lines of floats down the river. These logs are mostly pine of various kinds, though walnut and oak are also common enough.

The Liao flows through the great plain of Manchuria, entering the sea about twenty miles from the port of Newchwang. The most important affluent of this river comes from Mongolia, where it is called the Sira Muren, or "Yellow Water." But the greater volume of its waters is drawn by many affluents from Manchuria. This river is as muddy as the others mentioned are clear; for it runs its sluggish course through rich loam, with part of which it is always loaded. So large a quantity of mud does it deposit on the sea-bottom, that the land is ever steadily encroaching on the sea. The port, which is now the busy scene of the chief export and import trade of Manchuria, with about 100,000 inhabitants, was a century ago under water at every high tide; the port of that time was much higher up the river. This river is full of mercantile life. Many thousand boats, each manned by from two to seven men, cover its surface and its three principal affluents with almost continuous lines of white sails, carrying down the enormous stores of grain accumulated every autumn in the north.

The geologist could not fail to be interested in sailing up this tortuous river when its waters are low. It has in many places cut itself a channel fifteen or even twenty feet deep. A stratum of sand close to low-water is surmounted by another of coal-black loam, on which again is superimposed another layer of sand, the whole being covered by ten feet of the common yellowish soil of the country. Rock is encountered only after one enters the mountain region.

Soil.—The soil of Manchuria differs from every kind of soil in this country. Like clay, it is suitable for brick-making, for daubing or roofing houses, or for the building of dykes or huts, and when wet has the same sticky consistency. In colour it is lighter than the common clay of this country. Unlike clay, however, it is more porous than any soil I know of here. Its appearance suggests a mixture of two-thirds clay and one-third sand. In winter it cracks up in all directions in deep, perpendicular fissures from half an inch to four inches wide. It gapes similarly when it becomes dry after a flood. From Schuyler's *Turkestan*, I infer that the soil of that country is of a character similar to that of Manchuria and North China. It is particularly rich and fertile, virgin soil producing full crops for many years without manuring. Farmers often strew soil dug from the nearest bank over their exhausted fields instead of manure.

Baron Richthofen, who travelled a good deal in China and Manchuria, gave to the world, as the result of his experiences, the theory that this peculiar soil is the formation of dust storms such as he had seen in Tientsin. What seems to me still more strange is that a distinguished geologist has adopted this sub-aerial theory. To me for many reasons, most of which I must omit at present, the theory appears to be

untenable. It cannot account for all the phenomena, while some are inconsistent with it. For instance, you find in deep cuttings of this soil stones scattered here and there, from the size of a pebble to that of a man's head. It requires no very close observation to discover a more natural and satisfactory solution of the problem as to whence this soil called löss comes.

Löss is being formed in Manchuria every day. When granite is disintegrated by any agency it produces löss. When basalt is pulverised it becomes löss. This to me is the most puzzling part of the metamorphosis. When by disintegration or attrition granite, gneiss, quartz, and basalt become fine dust, that fine dust is of the greyish-yellowy colour of löss, possessing all its peculiar characteristics, while the coarser particles still retain the character of the parent rock. Of these rocks granite disintegrates most rapidly. The process of transformation from rock to soil can be seen on the line of hills skirting the great plain. On the surface you see a thin coating of finely powdered dust, which is soon blown away by a strong breeze, or washed down by the heavy rains. Underneath this thin coating are coarse particles of mica and felspar and somewhat larger grains or lumps of quartz. Still deeper you find some inches, and sometimes several feet, of rotten rock ready to be pulverised whenever it is exposed to the weather. This weathering process is somewhat notable. It is very decided on the southern slopes, least on the northern. On this account the southern face of the hills has a long gentle slope, while the northern is, on the contrary, frequently perpendicular.

Climate.—The Chinese place the beginning of spring among the early days of February. In March strong south-west breezes begin to blow, and continue more or less constantly for two months, bringing up warmth and moisture from the heated south. Towards the end of March the reign of winter comes to an end, sometimes quietly, but more frequently with a blustering storm of wind accompanied by sleet, rain, or snow, which melts as it falls. Ploughing becomes general throughout the country in the end of March, though the sub-soil remains ice-bound. The beautiful dog-violet and the shepherd's purse are the first forms of vegetation to make their appearance. These are succeeded by the pasque flower and some others, just as the grass begins to hide the clayey colour which holds complete possession of the country from the first November frosts. The various fruit-bearing trees in orchard, garden, or on the mountain side—cultivated or wild—tint the country with rose pink, or pale pink, while the numerous and graceful oval pear-trees throw out in a solid mass of snow-white petals. The honey-scented fragrance evolved by the warm sun in the secluded valleys on a calm day in April and May is an experience never to be forgotten. April may be said to be the only spring month, for May launches us at once into summer. So rapid is the growth under the bright sunshine and the penetrating power of the daily increasing heat, that wheat sown in the beginning of April is cut down in the end of June or the beginning of July.

Up to the end of July it is rare to have as much as twelve hours of light rain at a time; of heavy rain there is only an unusual and short-lived thunder-shower. During that period nine days out of ten give us bright, unclouded sunshine. Clouds are regarded with special favour, not only as containing the promise of needed rain, but as a feature of beauty in the usually cloudless sky.

But towards the end of July or beginning of August, when the heat is greatest, the heavy rains come on. These continue falling like the heaviest thunder-showers, often without intermission for several days and nights. If we have three days and nights of this rain, not only is the parched soil saturated, but the low-lying lands are flooded. Floods become more general and more destructive with every subsequent hour of rain. The floods which made such havoc a few years ago were of twelve days' duration; and, among the eastern hills, of twenty-one. At that time the soil on the sloping sides of cultivated hills became so soft that men sank in to their knees, when they went into their fields in the vain attempt to save some of their growing crops.

September is the harvest month; and a finer month than October in Manchuria it will be difficult to find anywhere. Then the air is dry, clear, and crisp, and the weather mildly warm; the trees are clad in their varied and brilliant autumn dress, and the larger flowers are everywhere luxuriant. Frosty nights creep on in the end of October; I have seen the thermometer fall 20° in an hour among the eastern hills, the fall being caused by the sudden change from a mild south to a frosty north wind.

In November the frost rapidly seizes everything. It holds earth and water in its iron grip till the strong south March breezes compel it to relax its hold and to allow the waters to run and the earth to clothe itself in green again. Throughout this period the only green thing visible is the mistletoe, with its red and yellow berries, growing on the elms and the willow-trees; or the pines which raise their solemn heads in small clumps all over the country, above the numerous burying-places of the people. All waters are covered with ice from three to four feet thick. Except a thin layer of dust on its surface, the earth is equally solid to a similar depth. Fire alone can penetrate that iced and stone-like soil.

In this climate, constant only in continuous change, and varying from more than tropical heat to Arctic cold, we have conditions sufficient to account for much geological change. There are four and a half months of summer, five of winter, one of spring, and one and a half of autumn. The gradual approach to greatest heat from greatest cold resembles the flowing tide, every day being like a wave. Some days fall short of the preceding, but the flood of heat progresses up to the hottest. The greatest heat brings clouds from the south abundantly charged with electricity. The heavy rains terminate the great heat and the ebb sets in, till, about the beginning of February, the maximum cold again seizes the land. The greatest cold is usually 17° below zero, or 49° of frost. Occasionally it reaches 27° below zero in Mukden; in Kirin the thermometer sinks considerably lower, to about 40° below zero. The day

temperature is rarely as low as zero, for even in mid-winter the sun is hot; so hot that it is unpleasant to sit against a window with a southern exposure. Mukden, I may state, is in about the latitude of Rome or Madrid. I am told by old people that the winters are less severe than when they were children. This can be readily accounted for by the deforestation of millions of acres during the present century. A similar cause has decreased the cold of Eastern Canada. The greatest heat touches 100° in the shade, and is considerably more in the broiling sun. In the tropics I have never seen the temperature at sea up to 90°.

Ten months at least in the year are very dry. For one month the atmosphere is supersaturated with moisture. The moisture-laden, warm breezes blow strongly from the south. The keen, dry, withering winds of the north blow down as if eager to abstract every particle of moisture. The hot sun bakes the surface of rock and earth, expanding it to a surprising extent. The same surface is contracted by the snell cold of the north. These influences are sufficiently powerful to account for the rapid and general disintegration which goes on under our eyes. The heavy rains make every hillside a muddy stream, which rushes into the nearest rivulet. These swollen streams roll into the rivers; the turbid rivers, overflowing their banks every year, distribute much of this mud over the surface of the country. But the greater proportion of their burden they carry to the sea, and lay it down on the sea-bottom, which is rapidly rising all along the coast-line. Such is the origin of the remarkable soil of Manchuria, and such is the silting process by which the plain and the valleys have been filled up and covered over by the rich soil known as löss.

Natural Resources and Products.

Minerals.—Throughout the extensive mountain regions running from the Songari to the southern sea gold is found in larger or smaller quantities. With the exception of one famous mine near Kirin, where the miners have for generations made a little kingdom of their own and defied the Government, the present dynasty has steadily forbidden gold-mining. There are two reasons for this policy. One is superstitious, based on the belief that it is unlucky to interfere with the configuration of the earth. The other I learned from a mandarin, who was the first to establish law and order over a wide region. When he went to his post, a hill near his city was occupied by a mining population of fully 10,000 men. When these men were successful, all went well; but when their supply of gold ran short, they went with their matchlocks to the nearest highway and helped themselves to the goods of travellers. He put an end to mining there. Search for gold is penal throughout the province. Silver and copper abound in many localities, but they are under the same laws as gold. The province is particularly rich in good coal and excellent iron. The working of these is barely tolerated in certain localities. In many places coal crops out above the ground, but the people dare not touch it. Native iron commands a price higher than any of European origin. A German officer once informed me that swords made in

Mukden were equal to the best made anywhere. But the smelting processes are so crude and primitive that it costs more to put this iron on the local market than to introduce the metal from Glasgow or Belgium.

Crops.—The main crop of the great plain is "tall" millet, or *sorghum*, of which there are eleven varieties. This grows from ten to twelve feet high. One variety, with a head formed of a considerable number of waving spikes, is used almost entirely in making spirit, which is largely drunk by the people to their meals. The grain of the other varieties is the principal item in the food of Manchuria's millions. It much resembles barley, and is boiled whole. The people eat salted beans or some vegetable along with the millet. It is far more nutritious than rice, which could not support life in the cold of Manchuria. This grain produces eight hundred-fold. Next in importance comes "small" millet, small as bird-seed. It is the chief article of food in Shantung, but of inferior value in Manchuria. It is said to produce eight-thousand-fold. Another small millet, called "yellow" millet, is very glutinous, and somewhat of a delicacy.

Barley is grown, but almost entirely for purposes of distillation, being mixed with the tall millet referred to.

Wheat is very general. In the more northern parts of the province and in the province of Kirin it is a common crop, and flour made from it is very cheap. Wheat and barley are the only grain crops which ripen so early that a second crop of some other kind can be sown on the ground and reaped in the same season.

Beans are of many varieties. One kind is of great value, as it forms the chief article of export. This particular kind is of the size of our common pea. The plant grows straight up, in many branches, to the height of from two to three feet. Its leaves are divided into three distinct and large leaflets. Its stem is crowded with pods, each containing three beans. It is particularly rich in oil, which is expressed under a great wheel of granite weighing several tons. The oil is used in cooking and for light, and is largely exported, but not to the same extent as the cake formed of the crushed beans.

Maize, or Indian corn, is extensively grown in the valleys where winter advances too early to admit of the ripening of tall millet. Tobacco grows luxuriantly all over the province, and is in general use among men and women, the latter smoking a very mild variety, and is also exported to other parts of China. Opium is now grown so extensively that it has become an article of export. Indigo is produced, and largely used and exported. It is the product of a polygonaceous plant, growing in marshy land. Jute, hemp, and castor oil are planted in the fields alongside the roadway to prevent passing animals eating the more juicy grains. A large cabbage and a bitter turnip are universally grown and used. These two vegetables are generally eaten, after they are soaked in brine, for the Chinese never eat salt, as we do, in its pure state. Garlic is highly prized. The onion looks like our leek. Chalots are found both wild and cultivated. Melons are of considerable

variety and in great quantity. The cucumber, vegetable marrow, egg-plant, and chili are common.

The root crops are potatoes, sweet potatoes, carrots, turnips of several kinds, kohl rabi, yam, and earth nuts. None of these is employed, as with us, to feed cattle.

Our chief fruits are grapes, plums, apricots, and peaches, the last being confined to the south of the province. The mountains yield mushrooms of various kinds.

Of ground game there are the axis, roebuck, antelope, musk-deer, wild wild boar, goat, and hare. Flying game are represented by several varieties of pheasant and of ptarmigan as well as by the partridge. Of furred animals we have the tiger, leopard, bear, wolf, several kinds of fox, pole-cat, marten or sable, squirrel, badger, and some others unknown to me.

From the Songari river we get what is known as white fish, sturgeon, carp of great size, cat-fish, and trout from the smaller streams. Salmon is caught in the far north, but the Chinese do not appreciate its flavour, preferring the varieties just mentioned. From the sea we get the mandarin fish, sole, herring, cod, "silver" fish, skate, and others, the names of which I am unable to give.

Trades.—All the ordinary trades of a civilised people are carried on with diligence and a fair amount of efficiency throughout the country. The most noteworthy are the furrier and tanning trades. In Mukden there are probably more furs cured than in any other city of the world. I am informed that there is no better curing anywhere. The tanner utilises every kind of skin. The ox, horse, mule, donkey, deer, and sheep hides are prepared in great quantities and for all sorts of purposes.

Population.—It is impossible to make any satisfactory estimate of the population of that great territory known as Manchuria. The province of Fungtien is, and has been for some time, fully occupied. Within the past twenty years the wide region marked on old maps as neutral territory has been converted into the comfortable home of hundreds of thousands of diligent farmers. In that time five new county towns or *Hien* cities have been established. The first mandarin of one of these informed me that his jurisdiction extended over cultivated valleys within a circumference of 270 miles. The province of Kirin is already taken possession of by the ploughman, but the larger province of Chichihar, with its millions of rich acres, is still waiting for husbandmen to develop its enormous agricultural resources.

Throughout Manchuria there are numerous large cities or country towns, from Mukden, the capital of all, with a population of over 300,000, down to villages and hamlets. The county towns are, from north to south, generally about forty miles apart; the distances from east to west are much greater. On the great plain, villages and hamlets, each with its little grove of willow trees, are so numerous and planted so thickly that you have scarcely left one behind before you enter another. Directly east from the port of Yingkou there is a flourishing country market town

called the "Great Stone Bridge," *Tashichiao*. It stands on the verge of the plain, just before you enter the mountainous country of the east. There, on one occasion, I made a careful list of all the villages within a radius of three and a half miles, or ten *li*, with the number of families in each. To my surprise, the result gave a population of fully 100,000 people. These people are entirely dependent on agriculture, no manufacturing industry of any kind existing in that region. An examination of another purely agricultural centre yielded similar results. Within the same area were seventy-five villages, the largest with 10,000 people, the smaller with a few hundreds. This fact will serve to illustrate the populousness of the plain, as also the great productiveness of the rich soil which can support so many. A number of years ago the population of Manchuria was estimated at 20,000,000. Since that time, by the natural increase of a fairly comfortable peasantry, and the endless stream of immigration from the overcrowded neighbouring provinces of Shantung and Chihli, there have been large additions. I do not think the population can be less than 25,000,000; it may be as much as that of England.

When the present Manchu dynasty left Mukden for Peking, the whole able-bodied population of Manchuria migrated as soldiers into China. These were partly Manchus, and partly Chinese, who had united themselves to the Manchus, and who received privileges for themselves and descendants similar to those of the Manchus. Manchuria was therefore virtually depopulated. In the period of Kanghi, measures were taken to repeople the country, which were so far successful that many were induced to go thither even from remote Yunnan. From that time, two centuries ago, to the present day, there has been a large annual influx from North China into Manchuria. Though, therefore, the country is named after the Manchus, they form but a small minority of the population. In Mukden only are they so powerful and numerous as to impress their personality upon society, and in that city alone is it fashionable for women to allow their feet to grow in their natural shape. At least three-fourths of the population of Manchuria are pure Chinese. The Chinese language, in its Pekinese dialect, is universal. In some remote valleys the Manchus have retained their own language. In Mukden educated Manchus write their original tongue in memorials to the Emperor, but not one of them can speak the language.

Competent judges have pronounced the inhabitants of Manchuria to be possessed of an amount of comfort greater than that of any other Asiatic people. The peasantry live, to a great extent, on their own small properties. The taxation is probably the lightest in the world. Food, fuel, and clothing, though coarse, are abundant. Therefore, in their cold winters the common people are more comfortable than the people of this country in weather such as we have recently experienced.

History.

In the voluminous history of China the affairs and manners of other nations are noted only when these nations come into friendly relations or hostile conflict with the Celestial Empire. The historical

descriptions of other peoples are therefore sometimes full and satisfactory, but usually of the most fragmentary and tantalising nature. Yet even these are valuable, as Chinese historiographers have for the past two thousand years taken great pains to be accurate, and in all ordinary circumstances they are fairly trustworthy.

During the period embraced in their very early history the Chinese were located at a great distance from Manchuria, separated therefrom by wide tracts of country and by barbarous peoples. They were, however, acquainted with the fact that the country now known as Manchuria was inhabited by a people who were, it would appear, located there before the Chinese became a nation. To this people, who have a shadowy existence before the time of Abraham, the Chinese gave the name of Sishun.

In the eighteenth century B.C. the name Sishun became Sushun. Six centuries later the kingdom of Chaosien emerges out of the historical darkness. This kingdom stretched from the Datong river in Korea westwards to the Liao in Manchuria, embracing all Liaotung and the west of Korea. It was more civilised than its northern neighbours, though inhabited by the same race. East of it there were more than a hundred clans occupying the rest of Korea; but we must infer that they were all of the same original stock. At that remote period the Sushun did not till the ground, and knew not the use of fire. In summer they lived in the hillside forests, and dug deep pits for winter accommodation. Their clothing consisted of a square foot of cotton around the loins. An inch of lard over their bodies formed their winter coat. They were therefore savages, with flesh or fish as almost their only food; and that they ate uncooked.

It is impossible now to ascertain the resemblances or differences in the customs of the numerous kingdoms into which this region was almost always divided. The languages, if not indeed of the same species originally, were certainly of the same genus. The names of men and of places in Mongolia, Manchuria, and Korea were polysyllabic two thousand years ago, as now. They were then as unlike the Chinese as they are now. It therefore needs no great stretch of imagination to suppose these Turanian tongues to have gradually diverged from a common parental stock. Is it necessary to note that the ancestors of the Turks were then in Southern Mongolia.

When the powerful Han dynasty became firmly seated on the Chinese throne, fully two thousand years ago, a formidable expedition was sent against Chaosien, and Liaotung was for the first time annexed to China. There were then, however, more deer than men in the province.

Hienbi.—In the first century of our era the kingdom of Hienbi was already established in the south-east of Mongolia. While general chaos and constant fighting prevailed in China, this small kingdom grew till it absorbed, not Liaotung only, but a considerable portion of Northern China. In the fourth century its rulers were styled Emperors. During that period the Huns—as the Mongols were then called—had risen to great power, and from various causes had again waned. Another branch of the Mongols assumed the title of Turks, and gradually absorbed the

remaining fragments of the Huns. These Turks acquired for a time an overwhelming influence over China, till they were driven westwards by the young Emperor who founded the Tang dynasty.

Liao.—While the Turks were springing up in Central Mongolia, a small clan of Mongols called Kitan, whose seat was on the Sira Muren, directly west of Kaiyuen, erected an independent monarchy, and in due course became a great nation. They assumed the dynastic title of *Liao.* As such they reigned over all Manchuria up to the Songari and over a large portion of Northern China, where meanwhile Buddhism had made its first enthusiastic march over all the land, submerging for a time all other considerations in the minds of high and low.

When the Kitan made their way eastwards to the Songari, they found to the east of that river a kingdom of no great extent, but of a high degree of civilisation. This was called Fuyü. Though this kingdom had all the arts of civilisation, another called Yilu, to the east and south-east of it, was still in primitive savagery.

Bohai.—These two kingdoms were succeeded by the kingdom of Bohai, which, like the others, arose from small beginnings. This power, in active rivalry with the Kitan, or Liao dynasty, wedged itself southwards, occupying Liaotung to the sea. It had five capital, fifteen prefectural, and sixty-two sub-prefectural cities or county towns. Every plain was cultivated and every valley occupied between the sea and the Amur. The north-east of Manchuria was then far more densely peopled than it has been for the past thousand years.

Kin.—From the neighbourhood of Ninguta a young prince, in a romantic career, established a kingdom which quickly overran the whole empire of the Liao, and pushed back the literary dynasty of Sung beyond the Yangtze River. He assumed the dynastic title of *Kin,* or "Gold."

Yuen.—While this Manchurian dynasty was climbing to its zenith, the name of Mongol was first introduced into Mongolia as the title of a young but active clan which speedily swallowed up its neighbours, and set up a power as strong as those of the Huns and Turks in former centuries. This Mongol power gradually spread westwards till it ruled over all the northern half of Asia and the southern half of Russia. It then approached India, and established the Mogul dynasty. It marched upon China, and upset the Kin dynasty in the north and the Sung in the south. Under Genghis Khan, with the title of the Yuen dynasty, China became one empire again, and was ruled from Karakorum, visited by the brothers Polo the Venetians.

Ming.—The whole of Manchuria was also a portion of this huge empire. The vices of this dynasty soon made it hateful to the Chinese. A Buddhist monk raised the standard of revolt, and, after much fighting, not only drove the Mongols out of China, but pursued them into their original homes, which had to acknowledge the sovereignty of the Ming dynasty. During the existence of that dynasty a steady emigration of Chinese to Liaotung set in, and the plain was brought under cultivation by millions of energetic farmers. It was then, also, that the frontier of China proper was fenced off by wooden barricades, the ghost of which

still appears in maps; the barricades themselves ceased to exist a couple of centuries ago.

Manchu.—A young chief of an insignificant highland clan, the descendants of the original inhabitants of Manchuria, began his career east of Mukden with thirty-two men. He died after establishing the Manchu "Empire." This extended from the Liao on the west to the sea of Japan, and from the Gulf of Liaotung to the Amur. His grandson was seated, at the age of five, on the Dragon Throne in Peking, where the dynasty has presided over the destinies of the huge Chinese Empire to the present day.

Even from this unsatisfactory skeleton sketch it will appear that Manchuria has for many centuries had a disturbing, and not infrequently a dominating, influence over the more populous and civilised Chinese Empire. Its chequered history illustrates many phases of human life deeply interesting to the sociologist. It shows how savage man can live in the most inclement of climates. It reveals the stages, sometimes by slow steps and timid, sometimes by giant and impatient strides, by which savage and incoherent fragments become cultivated and united nations. And it is no less faithful in relating how civilised peoples may be thrust back again into savagery and strong nations become disorganised units. We learn, too, that even a thousand years ago, when bows and arrows were the artillery, and javelins the rifles, in war, mental power was as potent a factor in gaining a victory as when the tactics of Napoleon confounded the Austrians or the movements of Von Moltke disconcerted the French. In all that curious history it is the wise general rather than the brave soldier who wins the day. History does not show that "Providence is on the side of the biggest battalions;" but it proves that the general who, though at the head of the smaller army, is able to concentrate a large number of men on a weak point presented by his less skilful adversary, is as sure of victory fighting with swords and javelins as when directing the fire of parks of artillery. Whether the age be one of Gold, of Silver, or of Iron, and whatsoever be the weapons of war in vogue at any particular time, MIND has always showed its superiority over matter, and intellect is ever more than a match for brute force.

The lessons of the numerous changes in Manchuria throughout the past two thousand years are an emphatic protest against much of the sentimental teaching of the present day. If the voice of these lessons is worthy of attention, it proclaims in trumpet tones that the social equality of all men signifies a state of freedom indeed, but it is the freedom of the savage. This history reveals, with lightning glare, that men may defy law, renounce social order, and treat authority with contempt; but in so doing they convert the crowded city into a desolation; they silence the busy workshop; they destroy the energy of the producer and the activity of the merchant; they break up even village communities; and, in making every man his own law-maker, they set every man against his brother. This history also proves that the amelioration of the savage is due to the individual, not to the race. An individual appears who is stronger and wiser than his neighbours. He is either born to authority over a larger or smaller number of his fellows, or he has that authority

conferred upon him, or he seizes upon it. This authority he exercises in winning rather than in compelling his subjects or neighbours to adopt changes which he recommends by example and by precept. Under him the savages who dug pits for shelter begin to build houses. Those who lived by the uncertain chase alone learn how to till the waste and rich land. Those who recorded events by notches in wood acquire a knowledge of letters. As a result, where once was an impoverished family there is a prosperous village; where there was a miserable hamlet, there is a city busy with the varied trades of civilisation; where no man's life was safe, multitudes carry on each his own business under the assurance that he and his possessions are safe from molestation. Not comfort only, but luxury, appears where life was formerly made up of days of want followed by surfeit. This change was not usually effected under one man, but one man always laid the foundations of progress, while his son or grandson raised the walls and completed the roofing of the edifice of civilisation, accompanied by shouts of gladness throughout the land.

Sad it is to have to add that with the disappearance of this true duke, this real king, the decadence down through anarchy to savagery is rapid. The descent is more or less rapid in accordance with the character of those in authority. The history of the rise and fall of every kingdom in Manchuria shows that the most valuable product of this earth is a MAN—the man who can dare and who can do, the man who can be the leader of men into a life nobler than they have hitherto led. The strong, wise, good man is the greatest boon humanity can receive. Equally needful is it to note that not one of those kingdoms fell merely because it was attacked by more powerful neighbours. The civilisation begotten of their prosperity produced luxury, and from luxurious habits sprang effeminacy, and their own effeminacy was their most deadly foe. In order to stand, a kingdom must not sink into a state of placid and self-complaisant indifference to everything which does not affect its ease and luxury. Steady persistence in wise justice in the face of all comers and of all theories—stern, undeviating adherence to the right at all costs—can alone conserve the kingdom, which they alone have righteously set up. China at the present moment serves to elucidate more emphatically these lessons from the history of the numerous ancient kingdoms of Manchuria.

THE "CHALLENGER" EXPEDITION.

THE reports of the great *Challenger* Expedition are now completed by the publication of Dr. Murray's "Summary of Results," in two portly volumes —an analysis of which may interest our readers. Not many years ago most naturalists believed that the deeper areas of the sea-floor were devoid of life. The researches of Edward Forbes had led that able observer and brilliant generaliser to infer that marine organisms, animal and vegetable alike, were more or less restricted to a relatively narrow belt, extending outwards from the coasts to depths of 300 fathoms or thereabout. Life

was found to be most prolific in the shallower waters—in the Littoral, Laminarian, and Coralline zones. Beyond the last-named was the region of deep-sea corals—a region destitute of plant life—extending from 50 fathoms to an unknown depth. "As we descend deeper and deeper in this region," he remarks, "the inhabitants become more and more modified, and fewer and fewer, indicating our approach towards an abyss where life is either extinguished or exhibits but a few sparks to mark its lingering presence. Its confines are yet undetermined, and it is in the exploration of this vast deep-sea region that the finest field for submarine discovery yet remains." Although later dredgings and soundings in the Mediterranean, the Atlantic, and other seas succeeded in bringing up marine exuviæ from much greater depths than 300 fathoms, yet naturalists still doubted whether these really indicated the existence of an abyssal fauna. It was thought probable that the remains in question might have been brought by currents from shallower zones, or might have fallen from the surface-waters to the bottom after death. But during the memorable voyage of H.M.S. *Bulldog* in 1860, Dr. Wallich captured highly-organised creatures in a living condition at depths vastly exceeding those to which animal life had previously been supposed to extend, and their presence there, he maintained, could not be regarded as an accidental or exceptional phenomenon. The existence of a deep-sea fauna was soon afterwards established on conclusive proof. In raising the telegraph cable between Sardinia and Bône, which had parted at a depth of 1200 fathoms, a quantity of coral and other organisms were found adhering to it. Again, in 1864, a Swedish naturalist, Dr. Otto Torell, dredged a large number of animals off the coast of Spitzbergen, at depths of 1000 to 1400 fathoms; and the subsequent expeditions of the *Lightning*, the *Porcupine*, and the *Shearwater* were equally successful in obtaining abundant and conclusive evidence of a deep-sea fauna. The *Lightning* expedition, under the charge of Wyville Thomson and W. B. Carpenter, showed that life is varied and abundant in depths down to 650 fathoms at least. During the first of three successive cruises of the *Porcupine*, Gwyn Jeffries found no lack of life at a depth of 1470 fathoms. Wyville Thomson, in charge of the second expedition, dredged successfully in water exceeding 2000 fathoms in depth, and these results were confirmed and extended by Dr. Carpenter in the third cruise of the same vessel. The result of these and of other preceding and contemporary expeditions having demonstrated that organisms lived at vast depths, and that the physical and chemical conditions obtaining in deep water and on the floor of the sea were neither constant nor uniform, "led to the conception of a great exploring expedition which should circumnavigate the globe, sound the most profound abysses, and investigate the physical, chemical, and biological conditions of the great oceans." On the receipt of representations from the Royal Society and other scientific bodies, such an expedition was organised by the British Government, and in December 1872 the *Challenger* set out upon her eventful voyage. She carried a full complement of specially selected naval officers, and a scientific staff consisting of Professor C. Wyville Thomson (Director), and Messrs. J. Y. Buchanan, H. N. Moseley,

John Murray, R. von Willemoes-Suhm, and J. J. Wyld. After circumnavigating the globe, and carrying on deep-sea and other investigations in many regions of the ocean, the *Challenger* returned to England in May 1876. Numerous scientific observations had been successfully recorded in all branches of oceanic research, and large zoological and other collections had been sent home from various ports during the voyage, and brought home in the ship itself. On the return of the expedition a temporary Government Department was created to direct the discussion of the physical and biological observations, the examination of the collections, and the publication of the scientific results, so far as these had a bearing on oceanography. Of this department, Sir C. Wyville Thomson became the Director, and Mr. John Murray first assistant. Unfortunately the Director's health broke down, and, on his death in 1882, Mr. Murray succeeded to the post. The laborious and responsible work connected with the publication of the Scientific Reports has been carried on by Mr. Murray in consultation with a Committee of the Royal Society. Only a few of the zoological memoirs had been published before 1882—the forty-six volumes containing the narrative of the cruise, and a large number of special memoirs having appeared under Dr. Murray's direction. To these are now added the two volumes just issued, which complete a series of fifty large royal quarto volumes—forming a monumental work, which will continue to be consulted and studied as long as the race preserves an interest in the scientific investigation of the world it occupies.

Before presenting our readers with an outline of Dr. Murray's "Summary of Results," we may note here that the reports of the expedition come under six divisions:—I. Narrative; II. Physics, Chemistry, and Meteorology; III. Geology and Petrology; IV. Botany; V. Zoology; VI. Summary. The reports under the various heads are the work of the following authors:

I. Narrative.—Staff-Commander T. H. Tizard, R.N.; Professor N. H. Moseley, F.R.S.; J. Y. Buchanan, M.A.,; John Murray, Ph.D.; all members of the expedition: the Narrative is partly illustrated by Dr. J. J. Wyld, artist to the Expedition.

II. Physics, Chemistry, Meteorology.—Commander Maclear, R.N.; Lieut. Bromley, R.N.; Staff-Commander Tizard, R.N.; Staff-Commander E. W. Creak, R.N., F.R.S.; Professor P. G. Tait, M.A., F.R.S.E.; Professor W. Dittmar, F.R.S.; J. Y. Buchanan, M.A., F.R.S.E.; Alexander Buchan, M.A., LL.D., F.R.S.E.

III. Geology and Petrology.—Dr. J. Murray and Professor A. Renard, LL.D., Ph.D., F.G.S.; John Gibson, Ph.D., F.R.S.E.; Professors Brazier, Dittmar, Sipöcz, Mr. Anderson, and others.

IV. Botany.—W. B. Helmsley, A.L.S.; Conte Abate F. Castracane degli Antelminelli.

V. Zoology.—Sir C. Wyville Thomson, F.R.S.; H. B. Brady, F.R.S., F.L.S.; W. B. Carpenter, C.B., M.D., LL.D., F.R.S.; Professor E. Haeckel, M.D., Ph.D.; N. Polejaeff, M.A.; S. O. Ridley, M.A., F.L.S.; A. Dendy, B.Sc., F.L.S.; Professor W. J. Sollas, M.A., D.Sc., LL.D.; Professor F. E. Schulze; Professor E. P. Wright, M.A., M.D.; Professor

Th. Studer, M.D.; Professor A. v. Kölliker; G. Brook, F.L.S.; Professor R. Hertwig; Professor H. N. Moseley, M.A., F.R.S.; J. J. Quelch, B.Sc.; Professor G. J. Allman, M.D., LL.D., F.R.S.; P. H. Carpenter, D.Sc., F.R.S.; W. P. Sladen, F.L.S.; T. Lyman; Alexander Agassiz; Hjalmar Théel; Dr. O. von Linstow; Professor A. A. W. Hubrecht, LL.D.; Professor E. Selenka; Professor W. C. M'Intosh, F.R.S.; Professor L. von Graff; G. S. Brady, M.D., F.R.S.; P. P. C. Hoek; Rev. T. R. R. Stebbing, M.A.; F. E. Beddard, M.A., F.R.S.E.; Professor G. O. Sars; Professor W. K. Brooks; C. Spence Bate, F.R.S.; Professor J. R. Henderson; E. J. Miers, F.L.S.; F. Buchanan White, M.D., F.L.S.; E. A. Smith, F.Z.S.; Rev. R. Boog Watson, F.L.S.; Leopold, Marquis de Folin; Professor A. C. Haddon, M.A.; Dr. R. Bergh; P. Pelseneer, D.Sc.; W. E. Hoyle, M.A., F.R.S.E.; T. H. Huxley, F.R.S.; G. Busk, F.R.S.; A. W. Waters, F.L.S.; S. F. Harmer, B.A., B.Sc.; Thomas Davidson, F.R.S.; Professor W. A. Herdman, D.Sc., F.R.S.E.; Dr. A. Günther, F.R.S.; W. K. Parker, F.R.S.; P. L. Sclater, F.R.S.; Marquis of Tweeddale, F.R.S.; Dr. O. Finsch; T. Salvadori; W. A. Forbes, B.A., F.L.S.; O. Salvin, M.A., F.R.S.; Howard Saunders, F.R.S.; A. H. Garrod, M.A., F.R.S.; Professor M. Watson, M.D., F.R.S.E.; Professor D. J. Cunningham, M.D., F.R.S.E.; Professor Sir W. Turner, M.B., LL.D., F.R.S.

VI. SUMMARY.—John Murray, LL.D., Ph.D., F.R.S.E.

Dr. Murray's report on the scientific results obtained at the sounding, dredging, and trawling stations of the *Challenger* is preceded by a compendious historical introduction of great interest—the preparation of which must have been a laborious work. The various heads under which he discusses the subject are, first, *The Science of Oceanography.* "The oceanographer," he says, "takes account of everything relating to the ocean. His investigations deal with the form and divisions of all marine areas on the surface of the globe; the winds that blow over the surface-waters; the contours of the ocean bed, from the sea-level down to the greatest depths; the temperature, the circulation, the physical and chemical properties of sea-water; the currents, tides, waves; the composition and distribution of marine deposits; the nature and distribution of marine organisms at the surface, in the intermediate waters, and on the floor of the ocean, as well as the modifications brought about in living things by the conditions of their existence; the relation of man to the ocean in the development of fisheries, commerce, civilisation, navigation, hydrography, and maritime meteorology. All this vast assemblage of knowledge, which embraces some aspects of astronomy, geography, geology, physics, chemistry, and the biological sciences, makes up the modern science of oceanography." Dr. Murray then discusses in succession the *Oceanographical Views of the Ancients; Oceanographical Views during the Dark Ages, the Middle Ages, and the Renaissance; Progress of Oceanographical knowledge from the voyage of Magellan to the voyage of Cook; Progress of Oceanography from the time of Cook to the 'Challenger' Expedition;* and lastly, *The Explorations of the 'Challenger,' and subsequent Expeditions.*

This historical introduction is followed by a general summary of the scientific observations and results at each of the *Challenger* observing stations. In these summaries the descriptions are almost exclusively limited to those investigations which were undertaken with the view of ascertaining the physical and biological conditions of the ocean. As showing their detailed character, it may be mentioned that they occupy more than twelve hundred pages of the report. There can be no question as to their great value to scientific men. Without their aid naturalists and physicists desirous of particular information must needs have had to search carefully through all the voluminous special reports of the expedition. Now they are saved that trouble, and find provided for them concise statements of the observations made, and the results obtained at each of the *Challenger* stations at sea. In the preparation of these accounts Dr. Murray has made use of the official log and note-books, the published reports, and his own journals. He has also given extracts from the manuscript journals of his colleagues, the late Professor H. N. Moseley and the late Dr. R. von Willemoes-Suhm. The great array of new facts contained in these summaries might be compared and discussed in many ways, and at one time, Dr. Murray remarks, it was proposed to do so, and to consider in detail the many theoretical views suggested. But owing to the urgent demand for the completion of the *Challenger* Report, it was found impossible to carry out this intention. We are presented, however, with some account of the bathymetrical and geographical distribution of the animals captured in the trawl or dredge. The species are grouped in seven zones of depth, viz : —(1) The zone deeper than 2500 fathoms; (2) the zone between 2000 and 2500 fathoms; (3) the zone between 1500 and 2000 fathoms; (4) the zone between 1000 and 1500 fathoms; (5) the zone between 500 and 1000 fathoms; (6) the zone between 100 and 500 fathoms; (7) the zone between 0 and 100 fathoms. In the zone deeper than 2500 fathoms the *Challenger* obtained about 600 specimens of invertebrates and fishes, belonging to about 235 species and about 200 genera. Between 2000 and 2500 fathoms some 820 specimens of invertebrates and fishes were procured, representing about 340 species and 250 genera. At depths of 1500 to 2000 fathoms 1250 specimens of invertebrates and fishes were obtained, belonging to some 500 species and 345 genera. Between 1000 and 1500 fathoms about 2000 specimens were procured, representing some 600 species and 400 genera. A similar number of specimens of invertebrates and fishes were dredged or trawled at depths between 500 and 1000 fathoms, the forms being referable to about 710 species and 425 genera. Between 100 and 500 fathoms about 6000 specimens were obtained belonging to some 2050 species and 865 genera. In depths under 100 fathoms a vast number of individual specimens were procured, representing about 4400 species and 1500 genera.

Thus the *Challenger* observations go to prove that life is distributed all over the ocean-floor. It is true that no dredgings nor trawlings have as yet been taken at the very greatest depths; but in the sediments brought up from the deepest abysses there occurred remains of foraminifera and sponges which had apparently lived at these depths. It is

remarkable that, at depths exceeding 1000 fathoms, the number of species as well as genera is large in proportion to the number of specimens—it being unusual to take more than four or five specimens of any one species in a single haul. This is in strong contrast to the fact that in depths less than 1000 fathoms, and especially in depths less than 500 fathoms, a single haul brings up immense numbers of individuals belonging to one and the same species. Again it is found that single hauls made in the deep sea obtain a much larger variety of animals than single hauls in shallow water. For example, at one of the stations in the Southern Ocean, at a depth of 1375 fathoms, 200 specimens were captured, belonging to 59 genera and 78 species. Nothing comparable to this has been met with in shallow waters. In the North Sea, at depths less than 80 fathoms, the greatest number of species obtained in one haul by the officers of the Scottish Fishery Board was only 29. Dr. Murray, however, mentions that in his own trawlings off the west of Scotland, in depths between 40 and 100 fathoms, he has sometimes secured as many as 50 species per haul.

In the shallower reaches of the ocean the nature of the materials covering the sea-floor naturally vary much, owing to the assorting and distributing action of currents. In some places sand, in others dead-shells and pebbles predominate: on submarine banks rocks and boulders present themselves; while in depressions fine mud and clay prevail. As a rule each of these bottoms has its own peculiar assemblage of animals, so that although single trawls may not bring up so many species in any one locality as from deeper water, yet the total number of genera and species inhabiting depths less than 50 fathoms is greater than in deeper water. With increasing depth the nature of the sea-floor and the physical conditions become more and more uniform, until a depth is reached below which the conditions are nearly uniform in all parts of the world, and where the fauna likewise presents a great uniformity. This depth is indicated approximately by the 100 fathoms line, and forms what Dr. Murray has designated the *Mud-line*. In quiet water this mud-line may be met with at depths of 5 to 20 fathoms; in the North Sea it occurs at a depth of 80 fathoms, while opposite the west coast of Scotland it descends below the 100 fathoms line. In short, the position of the mud-line is determined by the distribution of land and water, and is dependent on the depth and extent of the sea. All the minute particles of organic matter washed down from the land, carried away from shallow waters by currents, or derived from the decay of pelagic organisms, ultimately come to rest on the bottom in deep water, and principally just about and beyond the mud-line—which is thus the great feeding-ground of the ocean, and naturally swarms with life. Dr. Murray remarks that the majority of the animals living about and beyond the mud-line have no free-swimming larval stage, and the same is the case with deep-sea and shallow-water polar animals. These and other considerations lead him to suggest that the faunas in question are genetically connected with, and were derived from, the mud-line fauna of the present period, and of the not very remote geological past. On the other hand, most of the animals attached to, or living on, the hard bottom above and within the

mud-line in sub-tropical and especially in tropical regions have pelagic larvæ, and were probably for the most part derived from the mud-line fauna at a much more remote date.

As we have already seen, there is a gradual diminution of the number of benthos or bottom-living species with increase of depth, while in all the deeper zones the number of genera is very large relatively to the number of species—augmenting gradually with the greater depth. In like manner the proportion of new genera and new species increases with the depth and the distance from the land. The number of species limited to the shallower zones is very large, amounting to 92 per cent. in the zone of 0 to 100 fathoms, and to 75 per cent. in the zone of 100 to 500 fathoms, while the number of forms restricted to any one of the deeper zones is much less—namely, 55 to 65 per cent. Dr. Murray thinks that in all probability the deep sea was peopled by migrations downwards from about the mud-line. If such migrations have taken place at many different periods of time, and from many different parts of the world, it may be possible thus to account for the relatively large number of genera in the deep sea in proportion to the number of species.

As the number of benthos species and individuals diminishes with increase of depth, we might have expected that the same would be the case with distance from the shore. And this is true indeed of all the tropical and sub-tropical regions of the ocean, but it does not hold good for the great Southern Ocean, nor for some similar regions of the northern hemisphere, where the continental conditions are pushed far from land by the presence of floating ice. The diminution of benthos animals with distance from the shore cannot result solely from the greater depth at the seaward stations; for captures at near-shore stations yielded a much larger number of species and individuals than captures made at the same or similar depths beyond 300 miles from land. Further, the researches of the *Challenger* have shown that the terrigenous deposits, which lie along the shore-line, yield many more animals than the red clays and globigerina-oozes of remote seaward positions. Trawlings in the Southern Ocean, however, have demonstrated that this great region does not conform to the general rule, for large numbers of species were procured on all kinds of deposits in all depths, and at great distances from continental land. This, Dr. Murray suggests, may be accounted for by the continental conditions being carried far to the north, as already indicated; but he thinks it is likewise due to the greater abundance of food that falls to the bottom, and may possibly be connected with migrations of benthos animals equatorwards from polar regions.

The results of the expedition afford no justification for the assumption that a universal and peculiar fauna of great antiquity occupies the deep sea. A certain resemblance, however, can be traced between the deep-sea faunas of Arctic and Antarctic regions. It is noteworthy, moreover, that many of the deep-sea forms, especially those found in very deep water far from land, present archaic characters. Some of these undoubtedly represent very ancient groups; but remnants of faunas coming down from very remote geological periods have not been encountered in the deep

sea, as many naturalists expected they would be. Sir Wyville Thomson was of opinion that a deep ocean, with a bottom temperature oscillating about the freezing-point, persisted from Silurian times to the present, and that there had always been an abyssal fauna. Dr. Murray, on the other hand, inclines to think that in Palæozoic times the ocean basins were not so deep as now, that the sea then had throughout a nearly uniform high temperature, and that life was either absent or represented only by low forms in great depths. "As in the Black Sea now," he remarks, "so also was there in all likelihood in Palæozoic times insufficient oxygen in deep water to support a deep-sea fauna. From many considerations, one is led to suggest that cooling at the poles commenced in early Mesozoic times, that cold water, descending then in polar areas, slowly filled the greater depths, and, by carrying down a more abundant supply of oxygen, life in water deeper than the mud-line became possible; subsequently migrations gradually took place from the mud-line into deep regions of the ocean basins."

The resemblances between the littoral faunas and floras of the Arctic and Antarctic regions are very remarkable, and have given rise to many speculations. Dr. Murray analyses the evidence obtained by the *Challenger* with regard to the distribution of the animals captured in three great zones of latitude, viz.: those taken within the tropics, those taken south of the tropic of Capricorn, and those taken north of the tropic of Cancer. The result shows that many species which are common to the regions south and north of the tropics do not occur in the intermediate regions. The species common to all three zones of latitude on the whole increase in number as the depth decreases, and the same is true of species taken only in the northern and southern zones, but not within the tropics. Only a relatively small percentage of bottom-living animals have a very wide distribution over the floor of the ocean. Dr. Murray further illustrates this subject by reference to the distribution of species captured south of the tropic of Capricorn, and of species taken in that region from depths greater than, and less than, 500 fathoms, and concludes that the evidence yields no sufficient grounds for the belief in the existence of a universal deep-sea fauna of great antiquity. "There are many indications," he remarks, "that the migration into the deep sea has taken place continuously since Mesozoic times, when possibly cooling set in at the poles, and is even now going on. The indications that this migration is taking place principally from polar regions are more distinct than those of migration from any other quarter." The distribution of the genus *Serolis* is cited as an instance of how animals have spread from the mud-line to deeper zones, and from the Antarctic area northwards, over the floor of the sea. It is altogether improbable, however, that littoral species can pass by way of the deep sea from the littoral zone of one polar region to that of the other.

In addition to the strictly benthonic, or bottom-living animals, there are likewise in deep-water regions numerous fishes, crustaceans, and other organisms which live within 100 fathoms of the bottom, and occasionally rest upon it. These creatures probably obtain their food by the capture of dead organisms continually falling from the surface to the

bottom. According to Dr. Murray they appear to have a much wider horizontal distribution than the surface fauna and flora, and oft-repeated tow-net experiments led to the belief that all the intermediate zones of depth were thus inhabited.

The surface and sub-surface organisms are distributed in zones of latitude—a very large number of the species being circum-tropical, circum-boreal, circum-antiboreal, and circum-polar. It is noteworthy that the pelagic foraminifera of the tropics are represented in north-temperate and south-temperate regions by a smaller number of species possessing less massive shells. Again the numerous pelagic molluscs of the tropics are provided with large calcareous shells; but the species gradually disappear from the surface as the Arctic and Antarctic regions are approached, till the group is represented either by naked species or by nearly identical minute thin-shelled species in both polar areas. These examples of the slight development of calcareous shells and other calcareous structures in cold polar waters are instructive when it is remembered that massive coral reefs existed in those regions during early geological periods. The ancient polar seas, it is inferred, must have had a temperature of 65° or 70° F., for, as Dr. Murray and Mr. Irvine have shown, the deposition of carbonate of lime is due to the secretion of carbonate of ammonia, which, decomposing the soluble lime-sulphate in sea-water, produces insoluble lime-carbonate to form shells. This precipitation takes place with great difficulty and very slowly in cold water, but easily and rapidly within the organism in warm water. That the polar seas in geological times were much warmer than now has long been recognised, and it has likewise been inferred, from the wide geographical distribution of fossil floras and faunas, that the climatic conditions of the globe were formerly more or less uniform—differentiation of climate into zones having apparently only commenced in Mesozoic ages. Many have been the speculations to account for the uniform conditions of early geological times—that which appears to Dr. Murray to be the most satisfactory being the explanation advanced by M. Blaudet, who has attributed these conditions to the very much greater size of the sun in the early stages of the earth's history. We doubt whether that speculation will receive much support from either physicists or geologists—the latter of whom will point out that strong evidence exists to show that even so far back as late Palæozoic times the temperature in what are now temperate zones must have been much lower than it is at present. The remarkable proofs of excessive glacial action in Permian or Permo-Carboniferous times which have of late years been obtained in India, Southern Australia, South Africa, and Brazil, seem antagonistic to M. Blaudet's speculation.

Dr. Murray is of opinion that pelagic algæ, radiolaria, and foraminifera are probably the slightly modified descendants of a very ancient universal pelagic fauna and flora. Life in its simplest form most likely first appeared in Pre-Cambrian times, in the detrital matter accumulated about the mud-line. From these simple forms the pelagic protophyta and protozoa were most probably derived. The fact that radiolaria and pelagic foraminifera occur in Pre-Cambrian rocks leads Dr.

Murray to infer that radiolaria were even so far back as Pre-Cambrian times more abundant than in modern seas; and their skeletons seem to have been more massive. Radiolaria and other silica-secreting organisms abound most where the water is less saline, and where the surface is affected by fresh water carrying fine clayey matter in suspension. We have thus a hint that the Pre-Cambrian ocean was probably not so salt as many parts of existing seas, that it had a relatively high temperature, and was more or less muddy in character. The great abundance of protistan life in the open waters of early ages would produce by death and decay an abundant supply of food at the bottom of the ocean, and this would bring about the most favourable conditions for the evolution of the metazoa.

Dr. Murray holds that all highly-organised pelagic animals are descended from ancestors which lived in the shallow waters surrounding the land. If the whole ocean had formerly a uniform climate, the same species of benthonic animals may be supposed to have been nearly everywhere present in the shallow-water zones. When cooling at the poles set in, animals with pelagic larvæ would die out or migrate towards warmer latitudes. By the reproductive process being limited to summer, some of these organisms with free-swimming larvæ have been able to survive in temperate regions; but in tropical and coral-reef regions we have the remnants of a once universally distributed shallow-water fauna. When this shallow-water fauna had disappeared from polar regions, it would be replaced by organisms from the deeper mud-line, very few of which possess pelagic larvæ. In this way, Dr. Murray accounts for the identity or similarity between the polar marine faunas and floras; for the great abundance of individuals and the relatively few species in the polar areas when compared with the tropical area, as well as for the greater resemblance of shallow-water polar animals to deep-sea species. He also supposes that the fresh-water fauna has likewise been chiefly derived from mud-line animals.

It is very remarkable that among benthonic animals there is hardly a species common to the east and west coasts of Africa, if certain brackish-water and deep-sea forms be excluded. It might be held that the greater variety of conditions which obtain on either side of that continent, as compared with those of polar regions, have produced a more rapid modification of species in the former than in the latter area. On this supposition, it would follow that the faunas on the east and west coasts of Africa, notwithstanding their very distinct character, have not been separated for so long a time as the polar faunas, which more closely resemble each other. Dr. Murray, however, points out that the separation of the Atlantic and Pacific marine faunas is not so complete at the Isthmus of Panama as that of the faunas on either side of Africa. He is thus led to infer that the separation of the latter is of much greater antiquity, possibly dating back to a time when there was a nearly uniform climate throughout the oceanic areas. He thinks, further, that the distribution of life in the Antarctic or Great Southern Ocean seems to show that the small land-masses in that region have been separated from each other for a time sufficiently protracted to admit of specific

variations arising even in the cold Antarctic waters. This conclusion is thus opposed to the view that within recent geological times the continents have been connected by their southern extremities to a widely extended Antarctic Continent. Had such a wide extent of land formerly obtained, we should have expected to meet with very many circum-polar species. But in this respect the Antarctic Ocean contrasts strongly with the northern polar seas, where continuous coast-lines have probably existed for immense periods of time.

The general conclusion is reached that the distribution of the continental land-masses has had a great influence on the distribution of marine organisms, in shallow water and deep sea alike. In the long course of geological time the land-surfaces of the continental areas have been most unstable. Again and again they have been torn down by disintegrating and denuding agents—again and again they have been affected by subterranean action—now shoved up, now depressed. Coast-lines, therefore, have been continually changing. The researches of the *Challenger* have shown that the deposits which occur towards the central portions of the oceanic basins are almost entirely devoid of particles of quartz. But these become more and more abundant as the continental areas are approached, until they make up 80 per cent. of the deposits. It is obvious that such quartzose deposits are terrigenous—they have been washed down from continental lands. And as continental rock-masses consist largely of free quartz particles, and all contain such particles in less or greater abundance, it follows that they likewise must have been formed from deposits laid down near to pre-existing land. Rocks composed in this way of terrigenous deposits have again and again been pushed up to form new land, and again and again disintegrated and swept down to sea—"the various strata becoming more simple in composition, while the land-masses, on the whole, have become more complex in structure at each revolution." The true pelagic deposits are characterised not only by the absence of quartz particles, but, in the very deep water of the "central sea," by the presence of large quantities of iron and manganese, zeolites, metallic spherules of cosmic origin, sharks' teeth, and bones of whales—some of the latter belonging to extinct species. All these objects may be present as the nuclei of large manganese-iron nodules. According to Dr. Murray and Mr. Irvine manganese can, by successive chemical changes in and at the surface of marine deposits, be transported on the sea-floor from the coast regions out to the central and deeper areas. It is inferred that lime, iron, manganese, magnesia, and the alkalies have accumulated in the ocean and in abysmal deposits at the expense of the rocks of the continents. From these the bases are being continually leached out and carried away in solution—with the result that the heavier materials tend to be deposited in the abysmal regions, while the lighter insoluble and refractory quartz is accumulated for the most part on or near the continents. Continental rocks have an average specific gravity of 2·5; the abysmal deposits would form rocks with a specific gravity of over 3·1. "In the original superficial crust of the globe all the silica was probably combined with bases; the deeper layers would be more basic than the surface ones, but

all the rocks of the crust were probably much less acid than granite." Gneisses and granites, Dr. Murray further thinks, were probably formed subsequently to the commencement of subaerial denudation on our globe, and he refers to the inference of physicists, that the continental areas are lighter portions of the earth's crust. The grand result of all the denuding and reconstructing agencies has been a great accumulation of quartz and highly siliceous materials on the continents and the adjacent areas occupied by terrigenous deposits, and this is considered possibly the chief reason why the average level of the plane of the abysmal regions lies about three miles beneath the plane representing the average height of the continents.

Dr. Murray concludes with some general remarks on the relative permanence of continental and oceanic areas. In Palæozoic times it is probable that the ocean had throughout a nearly uniform high temperature, and the deposits formed under such conditions must have differed from what we now find in abysmal regions. Probably, also, the Ocean Basins were not so deep in those early ages, and they may have been studded with numerous islands built up of rocks similar to those that enter into the formation of existing continents. In the gradual evolution of the surface-features of our globe, continental land has on the whole become more compact, more circumscribed and higher, while the Ocean Basins have become more shut off from each other and deeper. Continental land has been far from permanent; but the areas within which the present continents appear would seem to have been the same areas over which continents have waxed and waned, have been built up and torn down, since the dawn of geological history. But similar revolutions have not taken place in the pelagic areas of the Ocean Basins to anything like the same extent, and not at all during the later geological periods. "In the evolution of the surface-features of the globe, and in the evolution of climate, as in the evolution of the solar system and in the evolution of organisms, there has been a progressive advance from simple to complex, from states of more or less homogeneity to those of greater heterogeneity."

We have devoted so much space to Dr. Murray's "Summary of Results," that we can do no more than call our readers' attention to the important appendix containing Dr. Buchan's masterly "Report on Oceanic Circulation." The first part of this Report deals with the surface of the ocean, and the second with the deeper waters. The report is illustrated by sixteen double-page maps. On the first two of these the distribution of the temperature and the specific gravity of the surface of the ocean is fully set forth. Twelve maps show the mean temperature of the sea at 100, 200, 300, etc., fathoms, down to 1000 fathoms, and at 1500 fathoms and 2200 fathoms. Map 15 shows the bottom temperature from 1000 fathoms downwards—map 16 giving the specific gravity at the bottom of the ocean within the same limits. The preparation of these maps, it is needless to say, has involved great labour, but the result is a most important contribution to the science of the sea.

It now only remains for us to congratulate Dr. Murray on the successful completion of this great national work. We cannot but

admire the vigour and enthusiasm with which he has directed the publication of the reports. After he had been some six or seven years in charge of this work, H.M.'s Treasury, it would seem, declined to ask Parliament to renew the annual grant for its continuation—the excuse being that the time estimated for the completion of the publications had expired. Surely this was a case of swallowing the cow and worrying at the tail. After some correspondence, however, in which the Director offered to finish the Report at his own expense, Government agreed to expend the sum of £1600 on the completion of the official publications. This sum, we are told, has been the only payment from Government funds in connection with the *Challenger* Expedition during the past six years. We regret, with Dr. Murray, that the necessity for the rapid completion of the Report has compelled him to forego the discussion in detail of many theoretical views which have been suggested to him by the numerous facts collected in his Summary of Results. His generalisations—even if they fail sometimes to carry conviction—are always welcome, for they are at once interesting and instructive, and we must hope that he will ere long return to his review of the immense mass of evidence brought to light by the memorable voyage of H.M.S. *Challenger*.

JAMES GEIKIE.

ARCTIC RESEARCH BEFORE FRANKLIN.

By W. SCOTT DALGLEISH, M.A., LL.D.

THE proposal to commemorate the fiftieth anniversary of the departure from the Orkneys of the ill-fated expedition of Sir John Franklin, has revived public interest in the subject of Arctic research. The expedition, consisting of the ships *Erebus* and *Terror*, which were already famous in connection with Antarctic exploration, sailed from Greenhithe on the Thames on May 24, 1845. The ships afterwards visited Orkney, and sailed on June 2nd from Stromness, the last British port at which they touched.

The Royal Geographical Society of London has arranged to hold a commemorative meeting there on May 24, at which some of the distinguished men who have taken part in Arctic exploration will be present. The programme will include an expedition by the river to Greenwich, and probably a visit to Greenhithe, whence Franklin sailed.

The occasion is one with which the members of the Royal Scottish Geographical Society cannot fail to sympathise. A special committee of the Council is organising an Exhibition of relics, and of objects illustrating Polar research, to be held in the Society's Rooms on June 4.

It is hoped, in these circumstances, that the following brief notes on the expeditions that preceded and led up to Franklin's supreme effort may not be devoid of interest.

The active prosecution of Arctic research began in the sixteenth century. The record, indeed, goes much further back. It begins with

King Alfred's account, introduced into his translation of Orosius, of the voyages of Octher and Wolstan in the ninth century,—a narrative which the royal author is supposed to have obtained from Octher himself. The expeditions of the Norsemen, which extended from the tenth to the fifteenth century, and which led to the Norse colonisation of Iceland and Greenland (and perhaps of the coast of North America), had their most probable motives in the attractions of seal-hunting and the love of adventure for its own sake. But they produced a work of great value in Ivar Bardsen's account of Greenland, which is the oldest extant work on Arctic Geography, and is therefore of great value.

When we reach the sixteenth century, however, we find a remarkable expansion of the ideas and aims of the explorers. Their motive was neither profit from seal-hunting nor love of adventure, but a very practical desire "to open a way and passage for travel to new and unknown kingdoms," and, above all, to discover a sea-route to India and Cathay. During the Middle Ages the trade with the East was in the hands of the Venetians and the Genoese, and it was with the hope of sharing in this source of wealth, with the advantage that a sea-route would give, that the Portuguese, under the guidance of Prince Henry, and afterwards the Spaniards on the representations of Columbus, sent forth expeditions, the former eastwards, the latter westwards. The voyage of Vasco da Gama solved the question of the eastern route, while the Spaniards found their way blocked by the American continent. Still intent on the treasures of the East, they diligently sought for a channel leading to the Pacific ocean. Stimulated by the success of Spain and Portugal, the English, and afterwards the Dutch, took their part in the search, naturally directing their efforts to the northern hemisphere, where they might hope to hold control over the passage, if discovered. That was the aim of Sir Hugh Willoughby and Richard Chancellor, who sailed to the White Sea (1553), and of Stephen Burrough and Arthur Pet, who discovered Novaya Zemlya, and the Strait of Waigatz leading into Kara Sea (1556 and 1580). The idea of discovering a new route to India by the north-west seems to have been first discussed at length by Sir Humphrey Gilbert, and was prosecuted by Sir Martin Frobisher in three expeditions between 1576 and 1578; and here we have the first definite conception of the great quest which fired the minds of modern explorers, and in which Sir John Franklin and his brave companions perished.

Frobisher's lead was earnestly followed up by John Davis in three expeditions (1585-87), in the last of which he reported "no ice toward the north, but a great sea, free, large, very salt and blue, and of an unsearchable depth." The reasons in favour of the search of a north-west passage were powerfully set forth by him in 1595, in a tractate entitled *The World's Hydrographical Description*.

The project of a north-eastern route to India and the East of Asia was warmly espoused by the Dutch navigators in the end of the sixteenth century. Their hero was Wilhelm Barents, who made three voyages between 1594 and 1596, in the third of which he was fortunate enough to discover Spitzbergen. His expeditions were by far the most important of those undertaken in the sixteenth century. Their chief result was that

they led to very profitable whale and seal fisheries, in which the Dutchmen had the largest share. These fisheries received a fresh impetus from one of the expeditions of Henry Hudson, who in his second voyage, in 1608, explored the seas between Spitzbergen and Novaya Zemlya. In the previous year he had traced the east coast of Greenland as far north as to latitude 73°, and, between Greenland and Spitzbergen, had touched the unprecedentedly high latitude of 80° 23′ north. In these voyages, he was in the employment of the Muscovy Company. In his third and fatal voyage (1610), in which he was the servant of the Dutch East India Company, Hudson explored the east coast of North America, and discovered the Hudson River, and subsequently Hudson Strait and Hudson Bay, on the bosom of which he was abandoned by his mutinous crew, who left him to perish miserably on its waters.

Passing over the Danish expeditions promoted by Christian IV. (1605-1607), and those of Sir Thomas Button, on behalf of the Merchant Adventurers of London (1612-13), we come to the important achievements of William Baffin and Robert Bylot (1615-16), who discovered Baffin's Bay and Smith Sound,—the latter named after Sir Thomas Smith, the liberal supporter of the expedition, and the first governor of the East India Company. Baffin's great feat, however, was the discovery of the wide channel stretching northward from Davis Strait, and bearing his name.

We come next to the familiar Fox Channel, to the north of Hudson Bay, and between Baffin Land on the east and Melville Peninsula on the west. This passage was discovered by Luke Fox, who was sent out by the Merchants of London in 1631, and who, on his return to England, wrote an admirable and most interesting account of his adventures—perhaps the best description of Arctic exploration in the English language.

The famous Hudson Bay Company was founded in 1670; but nearly fifty years elapsed before its officers took any noteworthy part in Polar exploration. An expedition, consisting of two ships, sent out by the governor of Fort Nelson in 1719, ended in disaster, both the ships and the crews being lost. A search expedition, undertaken by Captain John Scroggs in 1722, found no traces of the missing ships; but the information it gathered was believed at the time to establish the existence of a north-west passage to the Pacific, as a probability, if not as a certainty.

Toward the end of the eighteenth century, the servants of the Company discovered Wager Inlet, Wager River, and Repulse Bay; and, in 1789, Alexander Mackenzie discovered the great river which bears his name.

While these results were being obtained in the western Polar regions, the Dutch and the Russian whalers were busily engaged in exploring the eastern seas from Spitzbergen to Iceland, and from Iceland to the east coast of Greenland. One important result was the well-known Chart of Spitzbergen prepared by the two Van Keulens (1728). Another was the discovery by Vitus Bering (a Dane sent out by Peter the Great) of the strait between Asia and America (1728), and also of the Aleutian Islands and Mount St. Elias (1740).

In the same region, and about the same time, English whalers and explorers were active. Conspicuous among these was Captain Scoresby, who, in 1806, pushed his ship, the *Resolution*, northward as far as to 81°12′42″. Scoresby's valuable *Account of the Arctic Regions* is still a standard work.

The familiar name of Captain Cook now comes into the record. He made three voyages of exploration in the North Pacific Ocean, in the last of which (1778) he succeeded in reaching Cape Prince of Wales, the most westerly point of North America, in passing through Bering Strait, as far as to Icy Cape, and in surveying the coast of Asia up to Cape North. Captain Cook was thus the precursor of M'Clure, who was the actual discoverer of the north-west passage by the same route in 1851.

In 1818, Sir John Barrow induced the British government to offer a reward of £20,000 to any one who should make the north-west passage, and a bonus of £5000 to any one who should succeed in reaching the latitude of 89° N. These offers gave a certain impetus to Polar exploration. They led directly to the expedition of Captain John Ross in 1818, and to those of Lieutenant Edward Parry in 1819 and 1821-23. Parry discovered and named Barrow Strait, the westward extension of Lancaster Sound, and also Melville Island.

It was while Parry was engaged on his first voyage that Franklin made his *début* as an Arctic explorer. His expedition of 1819, however, was not a voyage, but an overland journey, from Fort York on the west coast of Hudson Bay to the Great Slave Lake, thence to the mouth of the Coppermine River, and thence along the coast for upwards of 500 miles, his most easterly point being Cape Turnagain. His companions were Richardson, Back, and Hood. Their sufferings on their return journey, from cold and lack of food, were intense, but at last they succeeded in reaching Fort Chippewayan.

The result of these explorations was to limit very considerably the unknown coast of North America. Cook, sailing eastward from Bering's Strait, had reached Icy Cape. Parry, sailing westward, through Lancaster Sound, had reached Melville Island. Mackenzie had arrived overland at the mouth of Mackenzie River. Franklin, Richardson and Back had reached, also by an overland route, the mouth of the Coppermine River, and had pushed eastward to Cape Turnagain. The distance between the extreme points east and west, reached by vessels, was thus reduced to 50 degrees of longitude. The next object of Arctic explorers was to connect, if possible, these points with each other, and also with the points on the north coast of the mainland reached by Mackenzie and Franklin.

With this view, several combined expeditions were organised in 1824, Captain Beechey was to follow the lead of Cook through Bering Strait, and eastward along the north coast. Parry was again to pass through Lancaster Sound, and was then to go southward through Prince Regent Inlet. Franklin was to make another overland journey to the north coast of the Hudson Bay Territory. Beechey succeeded in reaching Point Barrow. Franklin descended the Mackenzie River to its mouth, and explored the coast westward for 370 miles. At the same time

Richardson explored the coast between the mouth of the Mackenzie and that of the Coppermine River. He also sighted and named Wollaston Land, part of Prince Albert Land, across a channel which he called Dolphin and Union Strait. For reasons which subsequent discoveries have made obvious, Parry's exploration of Regent's Inlet led to no result. The expeditions returned to England in the end of 1826.

In the following year (1827), Parry made a brave attempt to reach the North Pole by way of the shores of Spitzbergen. He reached 82° 45′ N. lat., but the ice-drift stayed his further progress, and compelled him to return to England.

In 1829, Felix Booth, a rich distiller, undertook the equipment, at his own charges, of a private expedition to follow up the Arctic researches of Parry and Franklin. The conduct of the expedition was entrusted to Captain John Ross, and James Ross, his nephew. In their one small ship, the *Victory*, they passed through the Prince Regent Inlet of Parry to the Gulf of Boothia, and discovered a land which they called Boothia Felix. Their greatest achievement, however, was the discovery of the magnetic pole in King William Land. They also explored the north coast of King William Land, now a well-known Arctic island west of Boothia Felix. The prolonged absence of the Rosses caused much anxiety; and in 1833, a search expedition was sent out by land under Sir George Back. In the same year, the Rosses were picked up by a whaler, and were brought back to England. In the meantime, Back's search expedition, after wintering at the Great Slave Lake, descended the Back, or Great Fish River, whence the shortness of supplies forced them to return (1834).

The work of surveying the north coast of the American Continent was completed by the servants of the Hudson Bay Company. In 1837 Simpson and Dease succeeded in connecting the mouth of the Mackenzie River with Point Barrow—Beechey's furthest. In 1839, Simpson traced the coast eastward from Franklin's Cape Turnagain to the mouth of the Back or Great Fish River—and thence to the Castor and Pollux River. The survey of the north coast of the American mainland was completed by Dr. John Rae in 1846 and 1847.

Before that, Sir John Franklin had started on his final and fatal expedition; and in point of fact he was pushing his way southward from Beechey Island at the very time when Rae was exploring the coast of Boothia, which he subsequently found to be a peninsula, projecting from the American mainland. It may therefore be useful to take stock at this point of the state of our knowledge regarding the Arctic coast of North America.

Starting from Behring Strait in the west, we find that the coast of the mainland had been traced and mapped from Cape Prince of Wales to Point Barrow, from Point Barrow to the mouth of the MacKenzie River, thence to the Coppermine River, thence to the Back or Great Fish River, and thence to the Castor and Pollux River and the Boothia Peninsula. The southern coast of King William Land (west of Boothia), which had been discovered by James Ross in 1831, had also been explored.

On the east, there was a well-known open course westward from

Baffin Bay through Lancaster Sound and Barrow Strait. This was the course which Franklin was instructed to follow; and the problem he had to solve was, to establish a connection by sea between Barrow Strait and King William Land. He found (1846) a channel now known as Peel Sound, leading southward from Barrow Strait, between North Somerset and Prince of Wales Land. There he encountered a great barrier of ice; but he pushed his ships through it, and actually succeeded in reaching King William Land, where death overtook him in the midst of his triumph, and disaster overwhelmed his brave companions (1847). Franklin had solved the problem, nevertheless.

M. ELISÉE RECLUS AND THE *GÉOGRAPHIE UNIVERSELLE.*

(*With Illustrations.*)

Jacques Elisée Reclus was born at Sainte Foy-la-Grande, in the Gironde, on March 15th, 1830. He was the second son of a Protestant pastor who had twelve children, several of whom have gained more or less reputation in the literary world. M. Elisée Reclus was brought up in Rhenish Prussia, and received part of his education in the Protestant Faculty at Montauban. Thence he went to the Berlin University, where he studied under Karl Ritter. Being involved in the political tumults of the forties, he was obliged to leave France after the *Coup d'État* of December 2nd, 1851, and from 1852 to 1857 he wandered through England, Ireland, the United States, Central America, and Colombia, where he sojourned several years. On his return to Paris he published several articles in the *Revue des deux Mondes*, the *Tour du Monde*, and other publications, in which he made known the geographical results of his studies and voyages. Of all the journalists of Paris, M. Reclus alone supported in his writings the party of Lincoln during the American war; and it redounds to his credit that he indignantly rejected a large sum of money offered to him by the United States Ambassador in acknowledgment of his services, saying that he fought for justice and freedom, not for gain.

During the siege of Paris, M. Reclus served in the National Guard, and in the company of Aeronauts under the direction of M. Nadar. After the insurrection of March 18th, 1871, he continued in the ranks of the insurgent National Guard, and on April 5th was taken prisoner near Châtillon. Being brought before a council of war at Saint-Germain, he was condemned to transportation, but in consequence of urgent appeals made to the President of the Republic, notably by English men of science and politicians, among whom were Darwin, Wallace, and Lord Amberley, the sentence was commuted to one of banishment, on January 4th, 1872. M. Reclus first visited Italy, and then fixed his residence in Switzerland, where he settled at Clarens, on the lake of Geneva, and took up again his scientific pursuits. He refused to return to France until the general amnesty of all the condemned Communists was proclaimed in 1879. At the end of 1882 his political views were again brought into prominence by the proceedings instituted before the tribunal of Lyons against the

anarchists affiliated to the *Internationale*, of whom M. Reclus and Prince Krapotkin were designated as chiefs. The latter was condemned, but M. Reclus escaped, through his absence in Switzerland, from the untoward consequences that his political connections might otherwise have entailed. In 1892 he again left Paris, having been appointed to the chair of Geography in the University of Brussels.

In spite of his political opinions, M. Reclus has retained the regard of his friends and fellow-scientists. They have felt, no doubt, that he was not responsible for the violent acts of certain members of the party with which his name was connected, and that, though his ideas on social institutions were very different from their own, he was prompted solely by sincere conviction and philanthropic motives unalloyed by any sordid aims. Something of his feeling towards his fellow-men may be gathered from the *Dernier Mot* in the *Géographie Universelle*. "Everywhere," he says, "I have found myself at home, in my own country, among men who are my brothers. I believe that I have never been inspired by any feeling but one of sympathy and respect for all the inhabitants of the great fatherland. On this ball revolving so rapidly in space, a grain of sand in the midst of infinity, is it worth while to hate one another?"

M. Reclus' literary works are too many to enumerate. Among them may be mentioned *The Earth* and *The Ocean*, which, being translated into English, are best known in this country. But the greatest of all, and one which of itself is a sufficient base for his reputation as a geographer, is the *Nouvelle Géographie Universelle: La Terre et les Hommes. La Terre*, published in 1867-68, in which the author describes the general physical features of the world as a whole, forms a kind of introduction to the larger work, wherein the geography of the separate continents and seas is described in detail. But this detail is not carried to minuteness, nor is it the principal feature of the work. The *Géographie Universelle* is essentially a description of the world and its inhabitants, not a mere book of reference, though data, such as heights of mountains, lengths of rivers, and statistics of population, are sufficiently numerous. Under each country we find the orography and hydrography described in general outlines, and the resistance or assistance they have yielded to the progress of discovery, colonisation, and commerce. The fauna and flora are also dealt with, and, in harmony with the second title of the book, *La Terre et les Hommes*, a fair share is devoted to an account of the inhabitants, their customs, occupations, and beliefs.

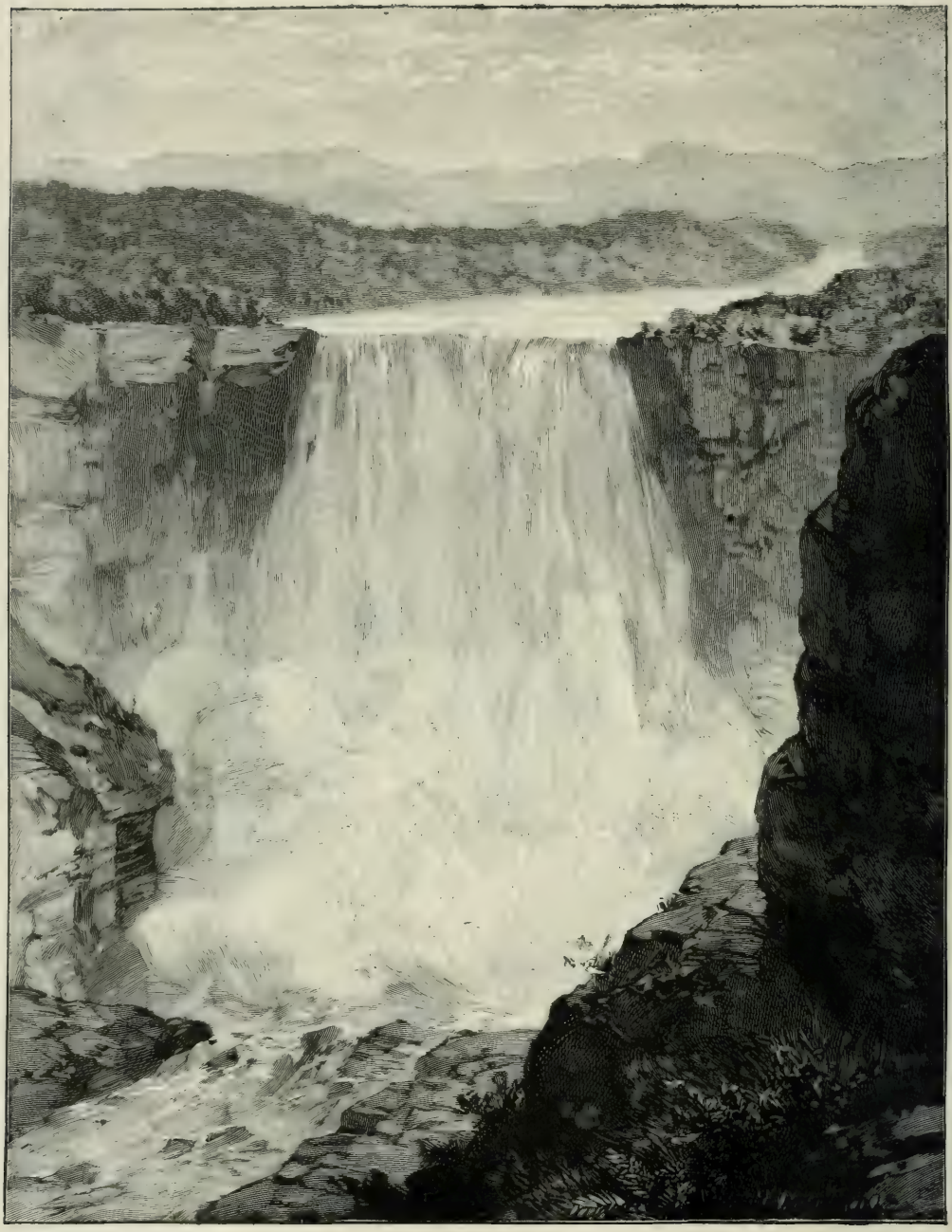
Several of the volumes have been reviewed in the *Magazine* as they appeared, and therefore, in the present notice, the last two volumes only, dealing with South America, will be briefly considered. Firstly, the continent is described as a whole; the similarity of its contour with those of Africa and Australia is pointed out; the absence of islands and peninsulas, so numerous in North America, is remarked on; the elevation of the continent and the effect of the Andes on its hydrography is set forth; and the climate, fauna, and flora, the inhabitants and their distribution, are commented on. Then each country is treated separately; its boundaries, actual or claimed, are defined; its history is touched on; and, as well as its natural features, its towns, commerce, and industry receive attention.

And these are portrayed in no bald fashion, but such details are incorporated as help to give a complete picture of the country. The dust-storms of the volcanic regions and their effect on vegetable and animal life, the *soroche* or mountain sickness experienced on the high plateaus of the Andes, the sudden changes of temperature in Matto Grosso, and other local peculiarities of soil or climate and their effects, are so described as to assist the reader in obtaining a complete and correct notion of the country in itself and as the abode of man.

To marshal all these innumerable facts, and at the same time to convey them in an agreeable style, is no easy task; but they are so blended together, the reader is led on so naturally from the first dawn of exploration to the physical configuration by which the early discoverers were guided, and then again to the geology, climate, and soil, on which depend the fauna and flora and the condition of human life, that he feels no weariness. Where opportunity offers, the style becomes elevated and rhythmical.

The project and the conditions of publication of the *Nouvelle Géographie Universelle* were arranged in 1872 between M. Reclus and M. Émile Templier, one of the heads of the Librairie Hachette, who unfortunately has not lived to see the completion of the work. It was to consist of twelve volumes (which number has been increased to nineteen), and the maps were to be drawn under the direction of the author. Each year M. Reclus commenced by drawing up a bibliography of the countries to be described. All the works on the subject in the library of MM. Hachette's establishment were sent to him; new works were bought, as well as such as were not to be found in the libraries of Paris and London, and M. Reclus went abroad to consult those that could not be removed from their resting-places. Furthermore, M. Reclus visited, when expedient, the countries he was about to describe, but for many colonies a voyage to the mother-country sufficed. Documents relating to the Dutch East Indies are more numerous at the Hague than at Batavia, and Cuba can be better studied, as far as written records are concerned, in Madrid than in Havana. The notes in the volumes show how thoroughly the task of collecting information was performed.

Two great difficulties presented themselves at the outset. One was the exile of the author, who was then in Switzerland, which prevented him from superintending personally the printing of his work. A correspondent in Paris was necessary, and M. Ch. Schiffer was appointed, and for twenty years conducted a daily correspondence and forwarded proofs. The other obstacle related to the maps, which were not simply reproductions of existing maps, but were drawn with especial reference to the text. The draughtsman at Clarens followed the instructions of the author, but errors crept in under the engraver's tool, and hence proofs were constantly going backwards and forwards. Accordingly, by the direction of M. Schiffer, the maps were drawn on Bristol card, incised in the style of copper-engraving. These were then reproduced directly by photogravure, and M. Perron, who drew all the maps from vol. iii. onwards, quickly attained great dexterity in this kind of work. Both these and the illustrations deserve a word of praise. The maps are numerous,



By permission of Messrs. Virtue and Co.

KAIETEUR FALL, BRITISH GUIANA.

and deal with a variety of facts—heights and depths, towns and their harbours, railways, tribes and density of population, mouths of rivers, etc. The illustrations are well executed, and show the buildings, geological and picturesque features of the country. In January of each year M. Schiffer drew up a list of subjects for illustration, and then set out in quest of material, almost all of which was found in Paris in the possession of travellers, amateurs, and merchants, or at the Geographical Society.

Of these illustrations we are able to give a specimen, the plate being kindly lent to us by Messrs. Virtue and Co., who have published an English translation of the work. It represents the celebrated Kaieteur fall in British Guiana, and is taken from *Canoe and Camp Life in British Guiana*, by C. B. Brown.

Meanwhile, M. Reclus continued to send in copy, sometimes from great distances, when he chanced to be on a tour in the countries he was occupied in describing. Yet, fortunately, not one packet was lost in transit. With the exception of a few pages, the whole of the manuscript was written by M. Reclus himself, in a regular and rapid hand, without erasures. Every week a part was issued, and at Christmas, when the last part was published, the bound volume was at the same time supplied to the booksellers. M. Reclus was assisted in revising the proofs by several collaborators in Paris—M. E. Desjardins, Madame Dumesnil, and his brother M. Élie Reclus, besides authorised readers in all parts of the world.

By permission of Messrs. Virtue and Co. we are able to publish a copy of the portrait of M. Reclus, which forms the frontispiece to the last volume. This portrait, engraved by M. Barbotin, is the only genuine one of the celebrated geographer that has appeared.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Lectures in April.

Captain Younghusband, having been suddenly called to India in connection with the war in Chitral, was unable to deliver the lectures in Edinburgh and Glasgow announced in the last number. At Edinburgh, Col. H. C. B. Tanner kindly took his place, and lectured on April 4th on the Himalayas. Col. Cadell V.C., presided.

On April 18th the Rev. John Ross, D.D., of Mukden, gave an address in Edinburgh on Manchuria. Professor C. G. Knott occupied the chair.

On April 19th a joint meeting of the Dundee Branch and the Dundee Naturalists' Society was held at University College. Captain Joseph Wiggins lectured on the "Kara Sea Route to Siberia." Sir John Leng, M.P., presided and moved a vote of thanks to the lecturer.

Captain F. E. Younghusband's paper on "Chitral and Hunza" was read by Col. Cadell, V.C., at a special meeting held in Edinburgh on April 25th, the Royal Geographical Society sending a proof of the lecture delivered in London, and Surgeon-Captain Roberts lending lantern slides.

Lectures in May.

Mr. G. F. Scott Elliot will deliver on May 2nd, in Edinburgh, an address entitled "To the Mountains of the Moon and Tanganika."

On May 16th Captain Cayley Webster will lecture in Edinburgh on "German New Guinea."

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

The Maximum and Minimum Temperatures of the Air in Norway.—Professor Mohn, Corr. Member of the Society, has kindly sent us the following communication :—"In the *Norwegian Almanac* for 1891 I gave a list of the highest and the lowest observed temperatures of the air for every month and for forty-eight stations in Norway. The observations from which these extreme temperatures were extracted did not reach very far back—Christiania from 1837, about ten stations from 1860, and the others from more recent dates—so that it is not strange that every year since 1891 has introduced corrections in the above-named list. Last summer (1894) and the winter just past have been particularly distinguished in this direction, and also the winter of 1893. In last February, particularly on the 6th, the minimum temperatures along the whole coast, from Oxö (Christianssand) to the Folden-fjord (lat. 65° N.), and the adjacent fjord-districts as far towards the interior as Ullensvang in Hardanger, Balestrand on the Sogne-fjord, Throndhjem and Stenkjær at the head of the Throndhjem-fjord, were lower than those formerly recorded, and the fall ranged from 2° to 8° F. My revised list of the lowest recorded temperatures in Norway gives the following results. The highest minimum, 10° F., was recorded at the lighthouses of Ona (coast of Romsdal) and Skomvær (the outermost island of the Lofoten group, very like a ship at sea); 7° F. was registered at Hellisö, a lighthouse off the mouth of the Sogne-fjord, and at Aalesund; 5° F. at Skudenes, Udsire, Bergen, Florö, Christiansund, Röst (Lofoten), and Andenes (lat. 69°); 2° F. at Balestrand and Lödingen (head of the Vest-fjord, lat. 68°); 1·5° F. at Vigten, Brönnö, and Fruholm (lat. 71°); −0·4° F. at Ullensvang, Sogndal in Sogn, and Tromsö (lat. 69·5°); −4° F. at Færder (mouth of the Christiania-fjord), Torungen (off Arendal), Oxö, Mandal, Lærdalsören (head of the Sogne-fjord), Orlandet (mouth of the Throndhjem-fjord), Prestö (Folden-fjord), Bodö, Fagernes (head of the Ofoten-fjord), and Gjesvær (the North Cape, lat. 71° 6′); −7·6° at Vardö; −12° F. at Throndhjem; −18° F. at Stenkjær; −22° F. at Christiania; −24° F. at Bjelland (inland from Mandal), Rundalen (Voss), Dovre, Jerkin (Dovrefjeld), Bossekop (Alten, Finmark); −31° F. east of the Christiania-fjord, Lake Mjösen, Hallingdal and Valders, Gudbrandsdal, interior of Throndhjem, Nordland and Finmark. Vossevangen, 160 feet above sea-level, between the Hardanger-fjord and the Sogne-fjord, had a minimum of −33° F.; South Varanger, the head of the Varanger-fjord, Hatfjelddalen (Nordland), Rena, and Elverum (Österdalen) of −40° F.; Röros, −47° F.; Tönset, −51° F. The absolutely lowest registered temperature in Norway was −60·5° F. at Karasjok in Finmark. Consequently we meet with the highest absolute minimum where the Atlantic Ocean or the Norwegian Sea directly impinges on the coast with its northwards-running current. The Naze (Lindesnes) and the North Cape, the most southern and northern points of the country, had the same minimum temperature, viz., −4° F.

The severest cold is experienced along the axis of the Scandinavian peninsula, and particularly between the Gulf of Bothnia and the Arctic Ocean.

"A temperature of 86° F. and upwards has been observed at the following places in Norway :—Hole, Ringerike, 87° F. ; Christiania, 93° F. ; Aas (south-east of Christiania), 86° F. ; Dalen, Thelemarken, 89° F. ; Eg, Christianssand, 88° F. ; Mandal, 87° F. ; Vossevangen, 93° F. ; Bergen, 86° F. ; Balestrand, 88° F. ; Sogndal, 89° F. ; Lærdalsören, 88° F. ; Aalhus, Sond-fjord, 89° F. ; Throndhjem, 87° F. ; Brönn, 87° F. ; Gjesvær, 86° F. ; Koutokeino and Karasjok, 88° F. ; Elvenes, South Varanger, 87° F. ; Nyborg, head of Varanger-fjord, 95° F.

"The lowest maximum temperatures occurs at Ona, 75° F. ; Andenes, 73·5° F. ; and Skomvær, 63° F.—all on the west coast.

"The largest absolute range of temperature is recorded at Karasjok, viz, 148·5° F. ; next come Röros and Tönset, with 133° F. ; and Vossevangen, with 126° F. The smallest range belongs to Ona, 65° F., Röst, 66° F., and Skomvær, 51° F."

ASIA.

The Pamir Boundary.—The agreement between Great Britain and Russia was mentioned on p. 77 of this volume. The *Times* of April 8th gives rather more exact details. The new boundary is to start from a point near the eastern end of Victoria Lake (Sor or Siri-kul) and follow the crest of the range running somewhat to the south of the latitude of the lake up to the Benderski and Urta Bel passes and beyond, as long as the range remains below the latitude of Victoria Lake. On reaching that latitude the frontier line will descend the spur lying towards Kizil Rabat on the Ak-su, and will then proceed eastward to the Chinese boundary. But should Kizil Rabat prove to lie further north than the lake, the line of demarcation is to be drawn to the nearest point on the Ak-su south of the latitude of the lake. Great Britain engages that the territory between this frontier and the Hindu Kush shall form part of the dominions of the Amir of Afghanistan, and that she will not annex it or erect forts there. The execution of the agreement is to be contingent on the evacuation by the Amir of Afghanistan of all territory on the right bank of the Panjah and by the Amir of Bokhara of the part of Darwaz lying to the south of the Oxus, and the contracting parties are to use their influence with the Amirs to bring about the evacuations.

Meteorology of the Military Post on the Pamir.—This post is situated at an elevation of 11,740 feet to the south-west of Rang-kul, in lat. 38° 8′ 30·7″ N. and long. 73° 57′ E. at the confluence of the Murghab and Ak-Baital. In the table sent by M. Émile Muller from Tashkent of the meteorology of the year September 1893 to August 1894, it appears that the mean annual temperature was 30° F. The lowest monthly mean was −12·8° in January, and the highest 62·2° in July. The rainfall of the year was 1·9 inches, nearly half of which fell in the months of May and July, while August and September were perfectly dry. South-west winds prevail from September to March, and north-west from March to August. Of all the localities in the Russian Empire the post on the Pamir has a climate most resembling that of the Trans-Baikal region, but the winter is a little warmer and the summer a little fresher. The lowest temperature recorded was −47·2° F., and the highest 81·5°. There is frost in the early morning at all seasons of the year. Though the quantity of rain that falls is remarkably small, the nebulosity is very considerable.—*Comptes Rendus* of the Paris Geographical Society, No. 1, 1895.

Formosa.—Herr Alfred Kirchoff has given in *Petermanns Mitt.*, No. 2, a description of this island, based chiefly on the work of M. Imbault-Huart, French

Consul at Canton. The area of Formosa he has measured with a planimeter on the map accompanying Mr. Hosie's report, and finds it to be about 13,500 square miles. Thus the island is less than half the size of Scotland, and a little more than half that of Ceylon. Its length is roughly 240, and its maximum breadth 90, miles. On the western side the land is rapidly encroaching on the sea, so that the lagoons, which appear in maps on the south-western coast, have long ago been turned into land. The site of An-ping, near Tai-nan, was in the seventeenth century, according to contemporary Dutch maps, a small island lying off the coast. The displacement of the coastline cannot be entirely explained by the action of the water; there must be, probably, a slow, but constant, upheaval taking place, such as Baron von Richthofen found evidence of on the north coast. The mountainous east coast descends steeply to the sea and shows no sign of advance.

The smaller western part of the island is for the most part low, consisting of plains not more than 20 to 25 miles broad, and hilly country, while the larger eastern half is occupied by mountains. It was these picturesque ranges rising above a thickly-wooded oreground, which earned for the island its name, given by Portuguese mariners in the sixteenth century. It is usual to speak of a lofty central range, but such a chain appears only where the island attains its greatest breadth. The mountains here run from south by west to north by east at about the same distance from either coast. The central elevated mass (the Ta-shan or Great Mountains of the Chinese) consists of several chains varying in height and separated by deep valleys; in the north shorter and lower ridges running in different directions compose the so-called Formosan Switzerland, and along the coasts of the southern promontory parallel chains terminate in two capes, enclosing the bay of Kwa-liang, a refuge for ships during the north-west monsoon. The elevation of the central chain is very varied. The highest summit of the whole island, Yü-shan or Jade mountain (Mount Morrison) rises from a neighbouring chain. As the snow in summer covers the mountain to a considerable distance below the summit, its height cannot be less than 13,000 feet. Towards the north the Thoa-sia, the Sylvia mountain of Europeans, attains a height of 12,350 feet. On the left of the mouth of the Tam-sui stands the Kuan-in-soan, and on the right the Ta-tun range rises to a greater height, the Ta-tun-soan being probably nearly 3300 feet above sea-level. Apparently it is a volcano not quite extinct; its crater, 500 feet deep, and 1000 feet in diameter, is converted into a lake in the rainy season. The solitary Chao-soan (Volcano Peak) rises behind this range to a height of 4320 feet, and the Ki-lung mountains skirt the north-east coast. In the south-western part of the island are located by Chinese geographers the Mu-kang-shan (Wooded Mountains), a steep and lofty range, and the Ta-kang-shan. South of the latter stands the Siao-kang-shan (Little Mountain), with two summits, an important landmark for sailors coming from the Pescadores. In the south-east are two high mountains, the Kueï-leï-shan, 4000 to 4200 feet high, and the wooded Pi-nan-mi-shan.

Of the geology of the island very little is known, and that little is fragmentary. The two mountains at the mouth of the Tam-sui are trachytic, and bands of water-worn stones and broken shells high above the sea show that considerable changes must have taken place in the sea-level within recent times. The Ki-lung mountains consist of sandstone containing rich seams of coal. Miocene and Pliocene formations occur, and particularly in the north volcanic action is still at work, exhibiting itself in geysers and fumaroles. Earthquakes are common; in 1782 a terrible earthquake lasted twelve hours, and caused great devastation.

Formosa has no large rivers navigable at all seasons. The best known is the Tam-sui, as Europeans call it (the Tam-shui-ki, or "sweet water brook" of the

Chinese), which is formed by the union of the Sintiam and Tokoham, and is navigable up to the confluence. But the largest river of the western slope is said to be the Nien-chao-ki, to the south of the town of Kia-y ; though broad, the stream, however, is not easily navigable, owing to its shallowness and sandbanks.

The climate is warm, for even in the north the mean temperature is 70·5° F. ; the mean range is 25·2° (January 57·6°, July 82·8°). Lying in the south-east Asiatic region of monsoons, the island exhibits a peculiar distribution of rainfall. The south-west monsoon of summer gives place in winter to the north-east monsoon, which, blowing over the warm Kuro-Shiwo, also brings rain on the north-east coast, indeed, the heaviest rains. Consequently, there are probably over a large part of the north of the island two rainy seasons. At Ki-lung the rainfall amounts to 120 inches, and attains a maximum between January and May, and a secondary maximum between August and October. Tam-sui receives a rainfall of 76 inches, and has a dry December, the heavy rain coming in spring. Tai-nan, on the south-west coast, has a very agreeable winter, especially in December and January, but the summer brings with it tropical heat and rains of tropical violence ; the thermometer rises to 100½° F., and throughout the day does not fall below 90½°.

It may be said in general that the flora of Formosa has much in common with the Indo-Malayan, and is more remotely connected with that of Southern China. The warm moist air nourishes nearly impenetrable jungle on the mountain slopes ; palms, tree-ferns, and bamboos grow everywhere, and bananas, including the *Musa textilis*, and a large variety of fruit and spice trees, besides sixty-five different kinds of timber, flourish luxuriantly. The fauna was thoroughly investigated by Robert Swinhoe, British Consul in China. Out of thirty-five species of mammals fourteen are peculiar to the island, and forty-three out of the hundred and twenty-eight species of birds ; but these are closely allied to forms in Asia and the other islands on the south-east of the continent. It is singular, however, that both fauna and flora show a much closer resemblance to those of India, Further India, the Malay Archipelago, and even Japan, than to that of the adjacent China. Wallace's conclusion is that Formosa was separated from the mainland at an early period (though certainly not before the Tertiary age), and that the fauna thus isolated produced new varieties through crossing with allied forms, while in China great changes took place which more and more obscured the connection of its fauna with that of India.

The natives of Formosa are undoubtedly of Malay race. This is proved by their corporeal formation, their language, head-hunting and other customs. Even now, where they have not come into contact with foreigners, they lead a somewhat barbarous life, chiefly as hunters, though settled in small villages composed of miserable low bamboo huts. The most northerly outpost of the Malay race, they have remained in the low stage of civilisation once no doubt common to the whole race, while in their isolation they have lost many of the arts known to their forefathers, among them, strange to say, that of navigation, without which they could not have reached their present abode. In the course of centuries many Chinese—pirates and other outlaws—found refuge on the coasts of Formosa ; but no Chinese authority was established in the island before the seventeenth century. In 1624 the Dutch East India Company took possession of the island where An-ping now stands, and built there the Fort Zelandia, and afterwards drove out the Spaniards, who erected Fort San Salvador on the bay of Ki-lung in 1626. But in 1662 Koshinga, the great opponent of the Manchu dynasty, captured Fort Zelandia. Several of his family reigned over Formosa until 1683, when the Manchus took possession of the island and made it a district of the province of Fo-kien.

A third and important element of the population are the Pepo-huan (called

also Sek-huan or Shek-huan, *i.e.* half savages), who are in a state of dependence on the Chinese intruders, and have gradually adopted their customs without intermarrying with them. They differ anthropologically also from the Che-huan or Chin-huan, the quite wild savages who are always eager to obtain the head of a Chinaman. The Pepo-huan are tall, bronze-coloured men with open countenances; they are brave, trustworthy and hospitable. The Chinese abuse their innocence, lending them money and thus gradually reducing them to virtual slavery; nor do they hesitate to drive them by force from any good land they covet.

A comparatively small part of the island is at present cultivated, chiefly on the north-east coast and the low lands on the west. The chief crop is rice, harvested twice, and in some places three times, a year. Potatoes also constitute an important article of food, while wheat and barley are seldom grown. Sugar is cultivated all over the western side of the island, and tea as far south as the twenty-fourth parallel. Indigo, ginger and oil-fruits, melons, pine-apples, bananas, mangoes and other fruits are seen. Fishing gives occupation to many thousands, and the oyster-beds are very productive.

The natives, even before coming in contact with the Chinese, seem to have had some rough manufactures; they carved wood and the women wove nettle thread, as they do now. China grass is partly exported to China, and partly spun and woven by the Pepo-huan women. The making of sugar and the manufacture of tea are in the hands of the Chinese, who also obtain camphor, either entering the woods and taking it at the risk of losing their heads, or swindling the natives. Sulphur is one of the chief mineral products, and alluvial gold is found in several river beds, notably in the Ki-lung river, where it was discovered in 1890. Coal-mining promises to be a profitable industry in the Ki-lung mountains.

The larger centres of population in Formosa are emporiums for the foreign trade, and therefore are ports, or at any rate are not far removed from the coast. Tai-nan, formerly called Tai-wan, has had the most remarkable history. It lies near the right bank of the Namuki river at a distance of two miles from the coast, the space between it and the village of An-ping being now a low plain intersected with creeks. The population of the town, owing to the continued sanding up of the adjacent anchorage, is decreasing, and now probably numbers only 70,000. Twenty-five miles to the south stands Ta-kao, where is a harbour into which small steamers can enter; it is now the port for foreign trade in South Formosa. In North Formosa the important towns are those on the Tam-sui river. Immediately within the bar, which is always changing and can only be crossed by steamers in calm weather and at high tide, is the town of Tam-sui, a poor place of one narrow street. Further up stream lies the populous Tua-tu-tia, the principal centre for the preparation and export of tea, and beyond it Mang-ka or Bang-ka, at the limit of navigation for large junks and therefore a busy place. A much frequented route leads from Tam-sui to the important port of Ki-lung, thirty-two miles from the mouth of the Ki-lung river. It is a town of 1000 to 1200 inhabitants, which owes its existence almost entirely to the coal-mines about a mile distant. Su-ao, on the east coast, is a rising town situated in a fruitful valley, and surrounded by green fields and hills where tea thrives splendidly.

AFRICA.

Kassala.—This important post, taken last July by the Italians, is situated in lat. 15° 30′ N. and long. 36° 30′ E., at an elevation of 1700 (?) feet above sea-level. Behind it runs the Mareb, called lower down the Khor-el-Gash. From the yellowish dry soil the dust is raised by the strong wind, which blows at least sixteen

hours out of the twenty-four, and carried into every corner. The houses are built of earth mixed with straw. Water is yielded in abundance by numerous wells, but should be filtered in the rainy season. The inhabitants, formerly estimated at ten to twelve thousand, do not now number more than four or five thousand. The plan of the town is nearly rectangular, the faces being turned towards the cardinal points. The walls are of sun-dried bricks cemented with mud, and are flanked by a deep moat. In every street is a ditch, which is a receptacle for filth and rain-water, and sends forth pestilential exhalations. In the centre of the town is a large sandy square surrounded by the most important buildings, military, civil, and religious.

The surrounding lands are very fertile, but little cultivated. To the south and south-east the country is mountainous ; the mountain of Kassala is a granite mass with sharp outlines, rising to a height of 3300 feet above the sea, and 1500 feet above the Taka plain. The climate is on the whole healthy. After the rainy season, which lasts from June to October, fevers prevail, but they are not of a virulent kind.

The country between Kassala and the Nile is in general level, with isolated elevations here and there. It is intersected by two watercourses, the Gash, already mentioned, and the Atbara, called in Abysinnia the Takazze. The former runs parallel to the Atbara, and may be considered an affluent of this river, though it contains water only in the rainy season, and even then is generally lost in the sand, and seldom arrives at the confluence. In the dry season all that is left of the Atbara also is a few pools where the fish, crocodiles, and hippopotami take refuge. The usual caravan route in the direction of Khartum runs through Kedaref, the centre of a territory covered with verdure during the rains, and terminates at Abu-Haraz on the Blue Nile, on which the traveller embarks and arrives at Khartum in a couple of days. The distance from Kassala to Khartum has been stated sometimes at 200, sometimes at 250, miles ; and the route through Kedaref is still longer, but preferable, partly because of the water supply. Caravans take sixteen days to travel from Massaua to Kassala, and would probably require as many or more to make the journey from Kassala to Khartum *viâ* Kedaref. This was before the revolt of the Mahdi, whatever it may be now, a fine town, with large and neat houses, and would be an excellent place for a military station. The cultivation of tobacco had been developed ; and the country between the town and the Nile was to a large extent tilled by the natives.—*Bull. della Sezione Fior. della Soc. Africana d'Italia,* Dec. 1894.

GENERAL.

The "Challenger" Reports.—Now that the publication of these reports has been completed, the question of the disposal of the volumes is being eagerly discussed by scientific men both at home and abroad. Out of the 750 sets printed, only about 60 have been presented to members of the Expedition, Government departments, and a few libraries. Of the remainder 100 have been held in reserve until the completion of the work, and about 600 were offered for sale. Of some of the volumes the copies have all been sold, but of others as many as 200 copies are still in stock.

The cost of the Expedition and of the working up of the results and the compilation of the reports has been comparatively moderate ; and it would be more generous on the part of the Government, and more to the advantage of scientific progress, to present the volumes to libraries where they could be consulted by students, than to seek to reduce the expenses of the Expedition by the small sum

that might be realised by their sale. These reports are a standard work of reference in oceanography, and should be within reach of all, not locked up in private libraries, as will be their fate if offered for sale, for few scientific societies or individuals can afford to purchase a set. And not only might the complete sets be presented to the most important societies at home, colonial universities, etc., but also such of the volumes still unsold as relate to a particular branch of science might be given to societies interested in that branch. The *Geographical Journal* suggests that the approaching Geographical Congress would afford a good opportunity for the appointment of a committee to advise the Government on the most useful disposal of the copies.

Permanence of the Ocean-Basins.—At the opening meeting of the Royal Physical Society in November last, Professor Alleyne Nicholson, the retiring President, reviewed in his address this vexed question from the point of view of an opponent to the doctrine. He accepted Neumayer's sketch of the geography of the world at the time of the deposition of the Upper Jurassic rocks as correct in general outline. According to this, three main masses of land existed at that period: the Nearctic continent, consisting of the North America of to-day, but stretching eastward to Greenland and Iceland; the Brazilian-Ethiopic continent, embracing the whole of South America and Africa, and continuous across what is now the Southern Atlantic, and stretching up to India; and the Sind-Australian, including a large part of South-Eastern Asia, and extending from Northern China through Siam and the Indian Archipelago to Australia and New Zealand. Besides these larger divisions of land, there was a Scandinavian Island occupying the modern Norway, Sweden, Finland and adjoining districts; a Turanian Island around the Sea of Aral; and several islands of various sizes occupying the site of Central and Southern Europe. Professor Nicholson also alluded to the great vertical displacements that must have taken place in Palæozoic times in parts of North America, including the Rocky Mountains and the Appalachians, which are now covered with a more or less continuous series of Palæozoic sediments 30,000 to 40,000 feet in thickness, and argued that this vertical displacement must have been accompanied by some corresponding movement in the adjoining ocean beds, though, perhaps, not precisely similarly in kind and amount. He also objected to the view of Professor Dana that the present visible archæan exposures of North America and Europe represent the nuclei of the continent, for in all probability they had been covered with thousands of feet of marine sediments which have been worn away. Dr. Fraser Hume, writing of the deposition of the White Chalk in Europe, which extends from Antrim to Uralsk in East Russia, and from Scotland and Sweden to the south of France, had remarked that, while in France and Saxony the upper Cretaceous rocks are undoubtedly of the nature of shallow water deposits, in other regions, as in Russia, the chalk was essentially calcareous, and had a thickness of sometimes more than 1800 feet; and had concluded that the Cretaceous Mediterranean might have contained depths of 1000 fathoms and more.

But the crucial argument in favour of the permanence of the oceans was, Professor Nicholson remarked, the argument that no rocks are to be found in existing dry lands which can be compared to the deep-sea deposits at present in course of formation. While not prepared to admit that the deep-sea deposits of past geological ages must necessarily have been always of the same character, he believed that in the existing dry lands deposits similar in structure and character were to be found. In the red clays of the abysmal depths teeth of Tertiary sharks (*Carcharodon*) were often met with, and as the dredge swept up a few inches at most of the mud over which it moved, this proved that these deep-sea muds were

very slowly deposited, and must hence form a very insignificant element of the earth's crust in comparison with the deposits of shallow water. Hence, except under circumstances very favourable for their preservation, we could not expect to find deep-sea deposits occupying more than a very limited area. Several cases were cited of the occurrence of such deposits. In 1890 the lecturer announced in the *Trans. of the Edin. Geol. Soc.* that he had noticed the occurrence of beds of Radiolarian chert in the Ordovician beds of the southern uplands of Scotland. In Lanarkshire these cherts were accompanied by red and green mudstones which recalled to mind the red and coloured muds of modern deep-sea deposits. The lecturer also contended that a graptolitiferous series, such as the Moffat series, or the Stockdale series in the north of England, might probably be of deep-sea origin, though not associated with Radiolarian cherts, and he quoted Rothpletz as an authority for the existence of Radiolarians in the Silurian, and Rüst to prove their presence in the Devonian and Carboniferous rocks, of Europe. He also drew particular attention to the investigations of Messrs. Jukes-Browne and Harrison (*Quart. Journ. of the Geol. Soc.* vol. xlviii. p. 170) who discovered in the island of Barbados a whole series of deposits said to be of oceanic origin. These consisted of chalky limestones composed of (*a*) tests of *Foraminifera*, representing the modern *Globigerina* ooze; (*b*) siliceous earths ("Barbados earth") composed of tests of Radiolarians and Diatoms, together with sponge spicules, comparable with the Radiolarian muds of modern seas; (*c*) a second series of Foraminiferal limestones; (*d*) very finely levigated clays, coloured, mottled, or white, representing the red clays of the existing abysmal areas.

Professor Nicholson also discussed briefly the geological structure of oceanic islands, and the relative movements of ocean basins and continents, and mentioned in conclusion difficulties connected with the distribution of plants and animals, especially the sudden appearance of large groups of animals or plants, with but slight traces, if any, of pre-existent forms of a similar type. Nearly a quarter of a century ago Professor Huxley had suggested that in such cases the early developmental stages of these groups had been passed in some continent now buried beneath the ocean.

MISCELLANEOUS.

On March 16th the telegraph system of **Burma** was connected with the Chinese lines.

A convention has been signed by the Sultan of Morocco and the British minister regarding the purchase of the English Company's settlement at **Cape Juby** by the British Government.

Through the mediation of Uruguay, Paraguay has been induced to cede a length of about 64 miles of the Paraguay river to **Bolivia**, whereby the latter State obtains a waterway to the Atlantic.—*Deutsche Rundschau*, Jahrg. xvii. Heft 7.

A railway from **Vologda to Archangel** has been authorised. It will be 448 miles long, and will have a narrow gauge. When thus connected with the heart of Russia, the port of Archangel will probably advance in prosperity.—*Revue Française*, April.

In *The Report of the Danish Biological Station*, Prof. C. G. Joh. Petersen treats of the biology of flat fishes and the decrease of the **fisheries** on the coasts of **Denmark**. As elsewhere, fishes of much smaller size are taken than formerly. Most of the work is translated into English.

This summer a Swedish expedition will visit the southernmost parts of **South America**. The leaders will be Dr. O. Nordenskiöld (geologist) and Dr. Ohlin. Landing at Buenos Aires, they will proceed to Tierra del Fuego and remain there till the summer of 1896.

This is the hundredth year since **George Vancouver** returned from his successful voyage along the Pacific coast of North America, arriving in the Thames on October 20th, 1795. He died on May 10th, 1798, just as the first volume of his *Voyages* was published. The work was completed by his brother, John Vancouver. —*Globus*, Bd. lxvii. No. 16.

In the *Mittheilungen der Geogr. Gesellschaft in Hamburg*, 1891-92, the log-books of the *Jason* and *Hertha* in the **Antarctic** are published in a German translation, with remarks by Dr. Johannes Petersen on the scientific results of the voyages, and a map of the Dirck Gherritz archipelago by L. Friedrichsen.

Dr. Frederick A. Cook, whose proposal for an **Antarctic** expedition was referred to in vol. x. p. 100, intends to start from New York on September 1st. The expedition will sail in two small vessels, specially adapted for navigation amidst ice, and will take provisions for three years. Erebus and Terror Gulf will probably be reached by the beginning of December.

Near the falls on the **Columbia** river is a mountain which from year to year perceptibly advances towards the bank. It consists of a mass of basalt nearly 2000 feet high lying on a stratum of sandstone, the finer particles of which are washed away by rain-water. Sometime or other the mountain will glide down into the river and dam it up to form a lake.—*Deutsche Rundschau*, Jahrg. xvii. Heft 7.

The Right Hon. H. C. E. Childers, speaking at the Colonial Institute in March last, on the night of Mr. Borwick's lecture, made a statement on the naming of **Port Jackson**. A despatch was found in the Admiralty from Captain Cook, in which he says, "I have called it Port Jackson after your Lordship's secretary." This Mr. Jackson was afterwards made a baronet and changed his name to Duckett.

In the current number of the **Annals of Scottish Natural History** is an article by Mr. Eagle Clarke on the recent visit of the Little Auk to Scotland, and many observations of rare birds are recorded in the notes, some of which sought refuge from the severe weather of the past winter in parts of the country where they are not usually seen. The *Annals* also contain several pages of botanical news and notes.

M. Foureau has reported to the Paris Académie des Sciences the existence of a extensive **coal-field** in the **Sahara**, which stretches from north-west to south-east between lat. 27° and 28° N. and lat. 5° and 6° 30′ E. M. Foureau was able to ascertain its existence at nine points more or less distinctly. The formation at these points is characterised by the presence of crinoids and varieties of *Productus*. Numerous fragments of *Lepidodendron* were also observed, which, transformed into a peculiar limonite, occur in strata of red sandstone.—*Deutsche Rundschau*, Jahrg. xvii. No. 7.

M. Cleveland, President of the United States, has, in his capacity as arbitrator in the **Misiones** boundary question, awarded the disputed territory, about 3840 miles on the 26th parallel, to Brazil. The decision was based on the fact that the territory has been occupied by the Brazilians since 1840 ; they have founded settlements—Palmas among the number—and exercised judicial and administrative functions without any interference on the part of the Argentine Republic.—*Verh. der Gesells. für Erdkunde zu Berlin*, No. 3, 1895.

The Edinburgh Summer Meetings will be held this year as usual under the direction of Professor Geddes. The lectures will commence on August 5th, and will be continued to the end of the month. The courses are grouped under the following headings:—Social Science and Philosophy; Civics and Hygiene; History, Literature, and Language; Psychology and Education; Biology; Geography and Geology; Chemistry; Sloyd; Fine Art; Musical Recitals; and Excursions.

Among the lecturers we find several who have assisted in former years—Principal Lloyd Morgan, M. Demolins, Dr. Dyer, Mr. J. Arthur Thomson, Messrs. Wyld, Branford, Capper, and others. There are also several fresh names, including M. Elisée Reclus, M. Hamon, and Dr. Delius. The lectures on Geography will be delivered by Prof. Geddes, M. Reclus, and Mr. A. J. Herbertson; and Mr. J. G. Goodchild will conduct ten excursions for the purpose of studying Geology in the field.

Information regarding the classes may be obtained from the secretary, Dr. Riccardo Stephens, University Hall.

NEW BOOKS.

The Dawn of Civilisation: Egypt and Chaldæa. By G. Maspero. Edited by A. H. Sayce, Oxford; translated by M. L. M'Clure. With Map and over 470 Illustrations and Plans. London: Society for Promoting Christian Knowledge, 1894. Sup. roy. 8vo, pp. 800. *Price* 24*s.*

This goodly volume, the work of one of the foremost scholars among present-day Egyptologists, is worthy of its author. "His intimate acquaintance with Egypt and its literature," as Professor Sayce says, "and the opportunities of discovery afforded him by his position for several years as director of the Bulaq Museum, give him a unique claim to speak with authority on the history of the valley of the Nile." "The present work," he adds, "may be regarded as the most complete account of ancient Egypt that has ever yet been published." The first seventy-eight pages are devoted to a very clear geographical and historical account of the Nile valley, largely illustrated. One only regrets that the map, in order to include both Egypt and Assyria, is on a scale of about 250 English miles to an inch, and though the three woodcut sectional maps (pp. 72-75), to scales of 40 and 36 miles to an inch, largely compensate for this, they want the sharp clearness of good maps. The next 456 pages treat of the history and civilisation of Egypt to the end of the first Theban empire with the close of the thirteenth dynasty, but interspersed with geographical notices and illustrations of importance.

Of Chaldæa M. Maspero does not speak at first hand; but, as Professor Sayce remarks, "he has thoroughly studied the latest and best authorities on the subject," and he has used their statements with discrimination and care. The small woodcut map again (p. 563), to a scale of about 90 miles to an inch, is hardly equal to the general character of the volume and the other numerous and excellent illustrations it contains. The translation is well executed and reads pleasantly.

Memoir of Sir Andrew Crombie Ramsay. By Sir Archibald Geikie, F.R.S. London: Macmillan and Co., 1895. Pp. 397. *Price* 12*s.* 6*d.*

In his preface, Sir Archibald Geikie says that the preparation of this Memoir has been to him "a true labour of love," and this may account for its thoroughness.

We need not add that it is written with all that literary grace and lightness of touch which distinguish the writings of this author.

The meeting of the British Association in Glasgow in 1840 proved the making of Ramsay. It was then that he acted as secretary of a Glasgow committee charged with preparing a model of the Island of Arran and a collection of specimens of its rocks. Single-handed he did almost the whole of the work; and before an audience which included Lyell, De la Beche, Agassiz, and Murchison, he read a paper upon the island's geological structure. From this proceeded his first work, published in 1841, on *The Geology of Arran*.

Murchison having resolved to undertake geological tours abroad, and having formed at Glasgow a high opinion of Ramsay's ability, offered him in 1841 the appointment of assistant and companion to him on his travels, which Ramsay gladly accepted. But on reaching London he was informed by Murchison that he had procured for him a much better situation, viz., assistant geologist to De la Beche, then head of the Government Ordnance Geological Survey.

Thus Ramsay's feet were placed on the ladder which he eventually scaled with such vigour and success. In 1841 he was roving among the hills of South Wales, and gradually he mastered the geology of the Principality. Six years later he was appointed Professor of Geology at University College, London, and in 1848 he began his studies, in Wales, of glacial geology, a subject in which he was afterwards one of the boldest speculators. As Sir Archibald Geikie's Memoir shows, Ramsay was, like the great geologist Hutton, of a very lively disposition, brimful of fun, composing and singing comic scientific songs with the greatest *verve*, and writing letters and a diary overflowing with the most humorous sallies.

When the Jermyn Street Museum opened in 1851, Ramsay appeared as lecturer on geology, and during the same year the Geological Survey of Scotland was begun under his direction. He commenced on the coast at Dunbar, where he could trace in the base of the Carboniferous system. His field-work in Scotland was very extensive; but, the ice-fever having now got full hold of him, he also visited Canada and Switzerland to study glaciation in all its forms. In 1876, at the request of the Colonial Office, he visited Gibraltar for the purpose of reporting on the water-supply for the town and garrison, Professor James Geikie being his companion on this occasion. Ramsay's geological writings were always highly appreciated. His *Old Glaciers of Switzerland and North Wales* appeared in 1860; three years later came his popular *Physical Geology and Geography of Great Britain*; and in 1866 his important work on *The Geology of North Wales* was published.

In 1871, on Murchison's death, Ramsay became Director-General, a post which he held till 1881, when he was knighted and retired. He died and was buried in Wales in 1891, mourned by all who had ever come under his genial influence or sat as disciples at his feet. We are glad that so able and so sympathetic a Memoir as this has appeared. The portrait of Ramsay forming the frontispiece represents him in one of his graver moods. Excellent portraits of distinguished contemporary geologists are interspersed throughout the volume.

Le Congo: Historique, Diplomatique, Physique, Politique, Économique, Humanitaire et Colonial. Par ALBERT CHAPAUX. Bruxelles: Charles Rozez, 1894. Pp. 887. Illustrations and Maps.

This elaborate and popular compilation deals with the various aspects under which the basin of the Congo has become a sphere for Belgian colonial enterprise, and with the conditions, physical and political, that ensure or hamper its future development. It is written from the point of view of a Belgian Congo official, and

with the evident purpose of convincing his countrymen that, under existing economic conditions, the possession of this new field for colonisation and commercial development will eventually prove to be a safe national investment. The munificence of the sovereign founder is very properly extolled, and the work of Belgian explorers and administrators belauded, in every portion of the book; and the author has also referred to the activities of other explorers in the basin of the Congo. If Belgian enterprise should appear to predominate, it is only fit and proper, in a work of this sort, that it should do so; moreover, the opening up of the Congo is no longer an international hobby, but an exclusive drill-ground for the training of Belgian officials in the art of colonial administration.

The author has accomplished his task with considerable credit, considering the range and difficulty of the subject; and gives a very useful summary of the leading events in the history of the Congo. The following inaccuracies and blemishes are to be noted: Burton did not accompany Speke on his journey of discovery to the Victoria Nyanza; neither was he Speke's companion on the second journey of discovery, when Speke and Grant determined the outflow of that lake to be the White Nile (pp. 5 and 6); the author is quite wrong in his details as to the organisation of the Emin Relief Expedition under Stanley (p. 160); he is careless in the transcription of English names; he is wrong in asserting that the Arabs of the White Nile at any time engaged in "legitimate commerce"—unless slave-trading is legitimate; he is biassed in asserting that "*la religion fondée par Mahomet est faite toute de sensualité et de jouissance; la cruauté y est excusée et les pires pratiques rencontrent chez les musulmans la sanction religieuse*" (p. 838); he utters only a half-truth when he states that the Arab is "the irreconcilable enemy" of the white man, considering that, but for the Arab, European pioneer-explorers would never have been able to penetrate so deeply into the unknown continent (p. 841): and, finally, he is wrong to include Lake Albert Edward in the basin of the Congo, physically speaking (p. 143).

The author's concluding words indicate the character of the book:—

'*Belges, votre Roi, pour parer au danger qui menace sa chère Patrie, vous a fait don du Congo. La dernière, la plus belle des colonies du monde* [*sic*] *est à prendre ou à laisser: Belges, que ferez-vous?*'

The answer to this question has been (quite recently) postponed for another five years. Had it been given now, it would have been to decline so great a responsibility. Meanwhile, international jurists must decide how a neutral European State can hold a colonial possession, the "eternal neutrality" of which is destroyed by the acknowledged reversionary rights of France, and the original constitution of which has undergone changes that have not been sanctioned by the European Powers that created it.

Le Centre de l'Afrique. Autour du Chad. Par P. Brunache. Paris: Félix Alcan, 1894. Pp. 340.

M. Brunache, formerly an official in Algeria, took part in the expeditions under M. Dybowski (1892) and M. Maistre (1894). The latter mission was fruitful in geographical and political results. The expedition passed through previously unexplored territory between the Mobangi and Palem (the southern limit of Nachtigal), and between that place and the head-waters of the Benué. This region is one of the most interesting of the hitherto unknown parts of Africa; and although M. Brunache's narrative is somewhat meagre in detail, we are able to glean the main results of the expedition. Besides determining the water-partings between the Congo and Mobangi and the Congo and Lake Tsad, the two expedi-

tions supplied valuable information concerning the principal affluent of the Shari, and with regard to the country between the Shari and the Benué. Organised by the French African Committee, ostensibly to search for M. Crampel, but chiefly for the purpose of opening up a route to Lake Tsad, the two expeditions were conducted with creditable zeal. That under M. Maistre, who succeeded M. Dybowski, secured for France a sphere of influence (since recognised by Germany) extending from the French possessions on the Congo to Bagirmi, thus securing a right of way to Lake Tsad, which—somewhat unfairly—passes behind and through the legitimate *Hinterland* of the Cameroons.

M. Maistre's expedition was cordially received and aided by the officials of the Royal Niger Company on their arrival at Yola, and on the homeward journey to the mouth of the Niger.

Soudan Français: Kahel. Par Olivier de Sanderval. Paris: Félix Alcan, 1893. Pp. 442. Maps and Illustrations.

The author considers Futa Jallon the key to the French Sudan; and his travels in that region during 1879-1888, especially on the Kahel plateau, helped to make the country known to his countrymen, and gave the impetus to several French expeditions. His book is, on the whole, an interesting and well-written account of his experiences; but it is marred by many defects—digressions into European politics, diatribes against everything British, and pages of trivialities interesting only to the author's personal friends. His discursive and egotistic style prejudices the reader against a serious study of the geographical information that lies embedded in the body of the book. But those who have time and patience will find that M. de Sanderval is an accurate and sympathetic observer, and has a good deal of useful knowledge to impart. The original maps, attached to the volume, deserve special attention; and the illustrations, evidently by the author, are not wanting in artistic merit.

M. de Sanderval's work deserves a high place among the many excellent explorations carried out by the French in the region of Futa Jallon.

The Gates of Thibet. A Bird's-eye View of Independent Sikkhim, British Bhootan, and the Dooars, as a Doorga Poojah Trip. By J. A. H. Louis, F.R.G.S. Calcutta: The Catholic Orphan Press, 1894. Pp. 183.

Starting from Darjeeling on good hill ponies with a little caravan of servants and coolies to carry luggage and provisions, the author and a friend rode to Pashok, where tea grows luxuriantly and of good quality. The author censures the Indian Government for excluding Indian tea from Thibet for a period of five years, in its treaty with China, for brick or caravan tea could be made in Pashok suitable for the Thibetan taste. Crossing the River Teesta, our travellers entered British Bhootan and reached Kalimpong, which means "Assembly of Ministers, a fit name, as it appears, for the headquarters of the Scotch Kirk Missions." Its altitude is 4000 feet, and, "as at Pashok, the climate is simply delightful. European children grow as rosy, strong, and sinewy as they would in bonnie Scotland, and English annuals grow to double their customary height." An enjoyable ride brought the author to Pedong (4770 feet), where there is a Roman Catholic Mission, whose priests are completing a Nepalese dictionary. Then he entered Independent Sikkhim, "a tumbled mass of mountain spurs and deep valleys," and passing through Rhenock and Sedangchen (7000 feet), reached Gnatong (12,000 feet). A sketch of the flora of Gnatong and the surrounding hills, by Dr. H. A. Cummins, and a Note on the Fauna and Sport in the Upper Himalayas, by Lieut. C. Vickers, are appended. Our travellers then pushed on to Jeylap-la, or the Jeylap, on the

frontier of Thibet, reaching an elevation of 14,000 feet, and returned to Gnatong, as there is no rest-bungalow at the Jeylap. Riding back to Rhenock, they now struck northwards to Pakyong (4700 feet) and Guntok (6000 feet), the *de facto* capital of Independent Sikkhim. The government is carried on by a Council of Notables, presided over by the British Political Agent in the absence of the Rajah. Traversing picturesque scenery, they next reached Tumlong and its monastery, where they witnessed the ceremonies of the Lamaic ritual, and were visited by the Head Lama, and received offerings of milk, fruit, butter, and eggs. Returning to Pedong, the author resolved "to see something of the dreaded Terai and Dooars, and of the wealthy tea plantations of those unhealthy districts." So, traversing the Rissoom Forest, he went on to Pasheting and Ambiok and, crossing the Elephant Forest, reached Bullabaree. "The Elephant Forest is one of the most valuable of Government preserves for the capture of wild elephants." In one year, 118 were successfully captured. But this country, the Dooars, although the richest and most fertile, is the unhealthiest tract in Bengal, perhaps in the world, and the author suggests various remedies. Altogether, his book is very suggestive and interesting, and the numerous phototypes with which it is illustrated, as well as the clear map and valuable appendices, make it a solid contribution to our knowledge of the country traversed. The author does not state the year during which he made this trip of 237 miles.

A Round Trip in North America. By Lady Theodora Guest. London : Edward Stanford, 1895. Pp. 270.

Sister of the Duke of Westminster, fond of field sports, and evidently intelligent and lively, the authoress was not only assured of a warm welcome from our American cousins, but has written a very interesting book. Befriended by leading members of American society, she had not to undergo the trials of ordinary travellers, her very boxes being allowed to go "scot free" by the New York Custom-house, whilst a "chocolate-and-gold" steam launch, belonging to some American millionaire, whisked her party across the Hudson to Jersey City, from which a "special train" carried them to her host's splendid residence near Philadelphia. Another millionaire, who had driven four-in-hand all over England, drove her in a four-in-hand coach, "worthy of the Magazine in Hyde Park," to his stud-farm 15 miles off; and afterwards she drove to the Radnor Kennels, which "seemed very English and natural." Baltimore and Washington were visited under similarly wealthy auspices; and then, in a private railway car, the party went west by St. Louis to Denver in charge of a special guide, whose duty was "to show them America."

Crossing the Rocky Mountains and proceeding *viâ* Utah, they reached San Francisco in May 1894, and enjoyed "lovely hot weather." They explored, but were glad to leave, the opium-smelling quarter of the Heathen Chinee in San Francisco. Then they went on to Monterey, whose pinewoods, gardens, and humming-birds delighted them. The Yo Semite valley, with its magnificent scenery, next entranced them; after which they proceeded northwards through Oregon. Their private railway-car always furnishing them with comfortable quarters, they reached, *viâ* St. Paul's and Chicago, Niagara and Canada; and after a trip to Virginia, they returned to England, having accomplished "over 11,000 miles of railway travelling, and miles untold of driving besides, without an accident or a semblance of one," and having enjoyed "lovely weather, and universal kindness and courtesy from man, woman, and child." The book is illustrated with numerous photographs, and forms one of the most attractive books of American travel yet published.

Holland and its People. By Edmondo de Amicis. Translated from the Italian by Caroline Tilton. Vandyke Edition. New York and London: G. P. Putnam's Sons, n.d. Pp. vii + 484. *Price* 7*s.* 6*d.*

De Amicis' book appeared many years ago, and it is well known to readers of Italian. The translation suffices to convey the impressions of the author, though it is by no means perfect. Awkward and unusual expressions occasionally show that the translator is held in bondage by the original, and the choice of terms is sometimes faulty. Thus "*scarcity* of the garrison" (p. 107) should have been *smallness*, windmills do not *absorb* water (p. 113), and there is no need to substitute "obligatory instruction" (p. 450) for the usual term "compulsory education." Sometimes the Italian word is retained when an English equivalent exists, as "*ostensorio*" for pyx (p. 300). We should hesitate to coin a plural for *Bradypus*, but, if we did, it would not be *Bradypi* (p. 304). The Vijver at the Hague is not a "marsh" (p. 156) but a pool—to keep fish in alive (*vivus*). Of course, we expect to find "favor," "labor," etc., in an American book. Apparently succour is supposed to belong to the same category, for it is written "succor"; succ*u*r would have been better. In spite of such defects, the translation reaches the average standard of the present day.

The illustrations are excellent, justifying the title "Vandyke Edition," and the whole get-up of the volume is praiseworthy.

The Voyages of the Cabots in 1497 *and* 1498. By Samuel Edward Dawson, Lit.D. Montreal: W. Foster Brown and Co., 1894. Pp. 112.

This is an excellent and learned discussion of all the available information concerning these interesting voyages from Britain in the last years of the fifteenth century. Dr. Dawson is a Canadian well acquainted with the topography of the north-west coasts of the American continent, and is hence able to point out some errors in the views of those who have discussed the landfall of the Cabots in 1497. A close study of original authorities has led Dr. Dawson to abandon the view that the landfall of John Cabot was in Newfoundland, and to concur in the view that places it somewhere in the island of Cape Breton. He endeavours to show that this landfall was not at Cape North, but rather at the easternmost point of the island, at or near Cape Breton itself. The discussion is illustrated by many sketches from ancient maps. The paper ends thus: "Upon the easternmost point of Nova Scotian land of our common country John Cabot planted the banner of St. George on June 24, 1497, more than a year before Columbus set foot upon the main continent of America, and now, after almost four hundred years, despite all the chances and changes of this western world, that banner is floating there a witness to our existing union with our distant mother land across the ocean . . . What shall Canadians do to commemorate the fourth centenary of that auspicious day when the red cross was planted on the mainland across the western sea, and when on a point of land in our own dominion the English tongue was heard, of all the languages of Europe the first, upon this great continent—from the desolate shores of the Arctic Ocean on the north, to the silent wastes of the Antarctic on the south?"

Prince Henry the Navigator, the Hero of Portugal and of Modern Discovery. By C. Raymond Beazley, M.A., F.R.G.S. New York and London: G. P. Putnam's Sons, 1895. Pp. xxvii + 336. *Price* 5*s.*

This is a most interesting and very readable book, illustrated by numerous maps and portraits. The plan of the book is excellent. The author attempts with marked success to trace the progress of geographical and oceanological knowledge

among ancient and Christian peoples down to the time of Prince Henry in the middle of the fifteenth century. The life of Prince Henry is treated as the turning-point, the central epoch in a development reaching through many centuries. One-third of the text, at least, is occupied with the history of the causes in these earlier times which ultimately led to the advances during the Renaissance. The discoveries, the travels, the geographical views of the Greeks, the Arabs, the early Christian pilgrims, the Vikings, the Crusaders, and early navigators are all passed in review with much ability, and the effect of these early efforts on the life and work of Prince Henry and the other great navigators of the fifteenth and sixteenth centuries is pointed out with great clearness.

The story of Prince Henry's numerous voyages along the coast of Africa has been often told, but probably never with such brevity and correctness as in the present book.

Prince Henry is undoubtedly one of the great figures of the Renaissance and the age of great geographical discoveries. Mr. Beazley appears at times rather to exaggerate the influence of his hero on the progress of the world during the past four hundred years, and he deals very lightly with the fact that Prince Henry initiated the slave-trade among European nations. He says—"No Christian doubted the right, and—more than the right—the merit, of the Prince in bringing black slaves by sea from Guinea to Lisbon where they might be saved from the grasp of 'Foul Mahumet.'" Altogether the book is most excellent, and will be welcomed by all students of geography, to whom it would have been still more useful had footnotes, with references and quotations, been given.

Dom Henrique o Infante. Memoria Historica. Por Alfredo Alves. Porto: Typographia do "Commercio do Porto," 1894. Pp. 125.

Prince Henry the navigator is so well known amongst us, that we cannot expect in a new work much fresh information about his life and work. We have a special interest in the subject of this memoir as the son of an English princess, who seems to have been a woman of no ordinary character. But, as the author truly says, Dom Henrique belongs not to one country but to humanity at large, as the symbol of the spirit of a race at a certain historical moment. The great work of exploration initiated by Prince Henry, and which led to consequences of the greatest importance to all Europe, is fully and faithfully described in these pages, and the character of the navigator is portrayed with the warm admiration one might expect from a fellow-countryman. The memoir obtained the first prize at the competition on the occasion of the fifth centenary of Prince Henry's birth, and will be a valuable addition to Portuguese historical literature.

L'Expédition Française de Formose, 1884-1885. Par Le Capitaine Garnot du 30e d'Infantérie. Avec 30 Gravures hors Texte et un Atlas de 10 Cartes en Couleurs. Paris: Librairie Ch. Delavigne, 1894.

This monograph, which possesses more interest for soldiers than for geographers, describes in minute detail the events connected with the visit of a flying column to Formosa during the second stage of the Tongking War against China, the object of the French forces being to demolish the batteries of the port of Kelung on the north side of the island, as well as to take possession of the coal mines in the neighbourhood of that port. The book cannot be accused of being a precipitate performance, seeing that ten years have elapsed since the occurrence of the events it is written to relate. The maps are for the most part original, having been laid down by Captain Garnot himself. They are chiefly concerned with the country in the immediate vicinity of Kelung. The book, we may add, is illustrated.

The Planet Earth: An Astronomical Introduction to Geography. By RICHARD A. GREGORY, F.R.A.S. London: Macmillan and Co., 1894. Pp. viii+108. *Price* 2*s.*

Mr. Gregory has written a clear and interesting account of elementary astronomy so far as it concerns the earth, which should be of use to students, especially to those working for South Kensington Examinations, who will find it more readable than many other manuals. The second title to the book is, perhaps, justified by implication, but a suitable Introduction to Astronomical Geography is still wanted for our students.

The Preservation of Health in the Far East. Hints as to Clothing, Food, and Residence in China. By W. P. MEARS, M.A., M.D. London: Church Missionary Society, 1895. Pp. 47. Table of Contents and 17 Diagrams.

This brochure, written by an experienced medical missionary, is not only valuable for residence in China, but the details given of building, ventilation, drainage, and water supply are applicable to all tropical countries. Dr. Mears has a thorough knowledge of his subject, and gives exceedingly useful details, not only on the points above mentioned, but upon the climate of China, clothing and travelling, cooking and water filtration. The brief hints regarding the prophylaxis and treatment of disease are useful.

Mussel Culture and the Bait Supply, with reference more especially to Scotland. By W. L. CALDERWOOD, F.R.S.E. London: Macmillan and Co., 1895. Pp. 121.

For a number of years the condition of the mussel- and oyster-beds around our coasts has attracted a considerable amount of public attention in Scotland, more especially as the former are closely related to the daily business of line-fishermen by supplying them with bait. In this work Mr. Calderwood gives a clear account of the present unsatisfactory state of the mussel-beds in Scotland, and of the consequences as affecting the line-fishermen, who are now largely supplied with bait from Holland. A short description is given of each mussel-bed of any size along the coast, and of the mode in which they have been, in many cases, ruined by overfishing or neglect. An account is also furnished of the natural history of the mussel, of the methods of mussel culture, including the French or *Bouchot* system, and of the legal aspects of mussel fisheries and foreshore rights. The regulations of the Fishery Board for Scotland in relation to applications for "several" fishery orders are printed in an appendix, and also the Act of 1847 for the protection of mussel fisheries. Mr. Calderwood's work will be found of much use to those interested in the mussel fisheries or in fisheries generally.

The Statesman's Year-Book, 1895. Edited by J. SCOTT KELTIE, Assistant Secretary to the Royal Geographical Society, with the assistance of T. P. A. RENWICK, M.A., LL.B. London: Macmillan and Co., 1895. Pp. xxxi+1156.

This work fully sustains its very high reputation. From the range and accuracy of the information which it contains, it is invaluable to many besides the statesman; those who are desirous of really knowing the systems of government and the resources and conditions in war and in peace of the various states of the world cannot be referred to any publication more trustworthy. All the old features are retained, and that the editor-in-chief is alive to pressing and contingent problems is borne out by the special additional feature in this year's issue—the information

which is appended to the commercial statistics of the various countries as to their customs valuation.

Despite much skill and care, a work of this kind can be neither wholly complete nor wholly accurate. We have observed a few (but only a few) inaccuracies and omissions, while submitting the work to some tests. Thus, the lists of books of reference contain instances of lack of judgment—of due sense of proportion. Gibbins's *Industrial History of England* is too meagre to be included in the comparatively short list on page 96*c*. Palgrave's *House of Commons* should also be omitted, and May's *Parliamentary Practice* given. W. E. Hall's *Foreign Jurisdiction of the British Crown* and Dicey's *Law of the Constitution* are both worthy of mention. Professor Munro's *Constitution of Canada* and Bourinot's *Manual* should appear on page 221. On page 505 "Boutmy" is mis-spelt. On page 53, eight lines from the foot, the plural verb should be singular. In the clear and concise account of the revised constitution of Belgium (pp. 376-7) it should be stated, to avoid misconception, that no voter has more than three votes; also that failure to vote is treated as a misdemeanour, punishable by law.

Gazetteer of the Lahore District. By G. C. Walker, I.C.S., Settlement Collector. 1893-94. Revised Edition. Compiled and Published under the Authority of the Punjab Government. Lahore: *Civil and Military Gazette* Press, 1894. Pp. 336+lxvii.

This is a corrected and enlarged descriptive and statistical account of the district which contains the capital of the province of the Punjab. The work is full and accurate, and the copious information it supplies is made unusually interesting by the manner in which it is presented. The chapters on the people and social life, and on agriculture and other occupations, are particularly full and good. The same may be said of the account of the city of Lahore, with its buildings of historic interest or notable for their architectural features. This would serve as an excellent guide-book to any traveller visiting the locality—though it is rather disfigured by a too lavish use of French phrases, and uncorrected errors of the press are, in this section, too numerous. A map of the district and a glossary of vernacular and technical terms would have been a valuable help to a Western reader. The want of them is rather a serious defect, but otherwise the manual deserves high commendation.

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea), Shippers' and Importers' Directory, and Business Guide. London, Melbourne, Sydney, Brisbane, and Cape Town: Gordon and Gotch, 1895. Pp. 624.

The present—the twenty-sixth—issue of this admirable handbook is, in every way, equal to its predecessors; and it says much for the editorial skill expended upon its production that, while fuller of matter than ever, its bulk has not been increased. The equipment of maps is, as usual, very good. The gazetteers have been carefully brought down to date, and contain fresh information; but it appears to us that were the counties mentioned in which some of the smaller places are situated, an improvement would be effected, as when this locality is not given, difficulty is sometimes experienced in approximately fixing the positions of these little settlements on the maps. But this is a very small fault, and the only one we have to find with the volume. The full and numerous statistics are very interesting, but we can only quote those referring to immigration and emigration. These figures are for 1892 (the latest year for which they are available), and show that then the late crisis was severely operating in Victoria and Tasmania—the former

colony parting with 6203 individuals above the number coming in, and the latter with 663. The other colonies had a more satisfactory experience, the numbers of persons entering above those leaving having been for New South Wales, 9510; for Queensland, 1080; for South Australia, 2851; for West Australia, 4472; and for New Zealand, 4958.

The volume may be cordially recommended as a handbook to all interested in Australia.

Piscicoltura d'acqua dolce. Del Dott. Eugenio Bettoni. Milan: Ulrico Hoepli, 1895. Pp. 318.

This little manual forms an addition to the already considerable literature dealing with the culture of fresh-water fishes. It is divided into two sections, one of which treats of the *Salmonida*, and the other of the carp and other coarse forms; and the various subjects are logically and clearly arranged and illustrated by upwards of eighty woodcuts. There are chapters dealing with such subjects as the artificial fertilisation of the eggs, the rearing of the fry, their transport, etc., and the various apparatus made use of are pretty fully described. It gives a succinct account and description of the most modern methods of pisciculture.

In the Guiana Forest: Studies of Nature in Relation to the Struggle for Life. By James Rodway, F.L.S. Second edition. London: T. Fisher Unwin, 1895. Pp. xxiii (Introduction by Grant Allen) + 242.

Mr. Rodway's book is delightful reading to the naturalist, more especially to the botanist; and from the author's masterly and elaborate descriptions the untravelled reader can form some conception of the overpowering vigour of tropical vegetation. Since its general scope is correctly indicated in the sub-title, one cannot very reasonably object to the fact that the book gives to vegetable nature a predominance in its pages consistent with its actual position in the regions described. But the ordinary reader may be permitted a sigh of regret that more space has not been devoted to man and the lower animals, even although their subordinate rank did not entitle them to so much consideration. Thus, out of fourteen chapters, only one is given to "The Man of the Forest" and one to the brutes; while neither forest man nor forest brute figures in a single one of the sixteen beautiful illustrations of forest scenery. However, all this helps to bring home the truth of what Mr. Rodway preaches that "here, where nature is so much more rampant (than man), it is the tree which comes to the front—everything else seems subordinate. Men are few, quadrupeds scarce, and it is only when we come to insects and plants that we find a dense population." One defect in the book is the absence of a map. True, everybody is supposed to know where Guiana is; but a good map never comes amiss in a book of travel. In this particular instance, a map shaded to show the extent of "the Guiana Forest" would have been useful and appropriate.

Les Aurores Polaires. Par Alfred Angot. Paris: Félix Alcan, 1895. Pp. vii + 318. *Price* 6 *fr.*

M. Angot is one of the most distinguished of French meteorologists, and not the least of his many qualities is an enviable power of expressing the gist of serried columns of figures or the outline of abstruse theories in clear and interesting language which is intelligible to the laity. His latest work, which forms a volume of the French edition of the International Scientific Series, he has called *Polar*

Auroras, thus combining under one term the *aurora borealis* and the *aurora australis*, of which he prints a list of those observed between 1700 and 1890.

Much of the difficulty of interpreting the origin and significance of this wondrous "light" is due to the lack of adequate discrimination between the various aspects in which it is presented—sometimes a steady glow of indefinite form, sometimes a homogeneous arch, while at other times "the streamers shoot across the midnight sky," or there are bands of quivering light in the heavens. But above all it is necessary to distinguish between the auroræ commonly seen in our latitudes and those visible in more northerly regions. When this is done much of the contradictoriness of estimates of the height, extent, etc. of the phenomena disappears.

The common auroræ of low latitudes are high in the atmosphere, from 40 or 50 miles to an extreme which is certainly less than 1000 miles, and often have a very extensive geographical distribution, at times covering part of both the northern and southern hemispheres, and hence without any definite relationship to weather. M. Angot thinks they are best explained as induction phenomena produced by magnetic storms or earth currents, which perturbations they accompany; for their form and position are related to the general distribution of magnetism on the earth's surface, especially the mean values of the declination and inclination at a given place. As magnetic storms and earth currents have a close connection with the prevalence of sunspots, so therefore have auroræ.

But in Polar regions many auroræ are seen with streamers passing between some distant hill and the observer, and even may so surround him that their presence would not be suspected if the characteristic green line were not visible in the spectroscope, no matter whither it is pointed. Such auroræ are adequately interpreted by Edlund as phenomena of unipolar induction, and depend on meteorological conditions to certain extent.

For the details of this and other theories, notably the ingenious one of Unterweger, which seems to explain daily annual variations, readers are referred to M. Angot's lucid exposition.

As to the much-discussed relationship between auroræ and weather, M. Angot insists on the impossibility of arriving at definite conclusions, when phenomena of very different types are grouped together. The only approximation to a law is that of Forsman, who declares that when auroræ are visible in Sweden there is either a high pressure area or a rising barometer to the north-east of the neutral line between Scotland and the Black Sea. But there is an indubitable relationship between auroræ and certain types of cirrus, as their periodicities coincide; and some authorities insist that the one cannot take place without the presence of the other.

M. Angot concludes this excellent summary of our knowledge of auroræ by pointing out the importance of making further spectroscopic studies of this light, which is probably caused by electric discharges in rarified air, and especially as to the cause of the characteristic green line. What is the relationship between the bright green line in the spectrum of liquid oxygen and this auroral line?

Madagascar. Par ALBERT MILHAUD. Paris: Félix Alcan, N.D. Pp. 192. Sewed, 60 *c.*; boards, 1 *fr.*

This little work, which forms No. CXIII. of the *Bibliothèque utile*, contains much information compressed within a very small space. It is divided into three parts, the first treating of the physical geography of the island, with a concise account of its divers inhabitants; the second part dealing with its history; and the third describing its present political and social condition. Altogether, this unassuming and "popular" brochure compares favourably with many more pretentious works relating to geography and travel.

NEW MAPS.

WORLD.

DER WELTVERKEHR. Karte der Eisenbahn-, Dampfer-, Post- und Telegraphen-Linien, bearbeitet von G. Freytag. *Price* 2 *M.*

Verlag von G. Freytag und Berndt, Wien.

A map showing the depths of the oceans, steamer routes, railways, telegraphs, etc. Postal rates are also shown in inset maps. The depths of more than 6000 mètres are by no means clearly marked, and there are one or two errors respecting railways—for instance, the line from Vladivostok to Khabarovka should be marked as open—but the map is on the whole good.

ASIA.

INDIA, Bartholomew's Special War Map of the North-Western Frontier of ——, showing British operations in Chitral. *Price* 1*s.*

John Bartholomew and Co., the Edinburgh Geographical Institute.

Though called a war map, this sheet is not merely of temporary interest. It is rather a complete and useful map of the whole of North-Western India, and shows the latest changes in the frontier between India and Afghanistan, and the new boundary of Russia on the Pamir as defined by the late Anglo-Russian agreement. The inset map of Chitral and adjacent country, the scene of the present military operations, contains a large number of names and has the mountain ranges shaded.

KLEIN-ASIEN, Strassen-und Eisenbahnkarte von ——. Massstab 1 : 5,600,000.

Deutsche Rundschau, Jahrg. xvii. Heft 7.

FORMOSA, Karte von ——. Nach den besten Quellen entworfen von Prof. Dr. A. Kirchhoff. Massstab 1 : 600,000. *Petermanns Mitt., Tafel* 2, 1895.

AFRICA.

DAHOMEY ET RÉGIONS LIMITROPHES d'après les Itinéraires des Voyageurs et les Renseignments les plus récents par M. A. L. d'Albéca, Administrateur Colonial. Échelle à 1 : 3,000,000.

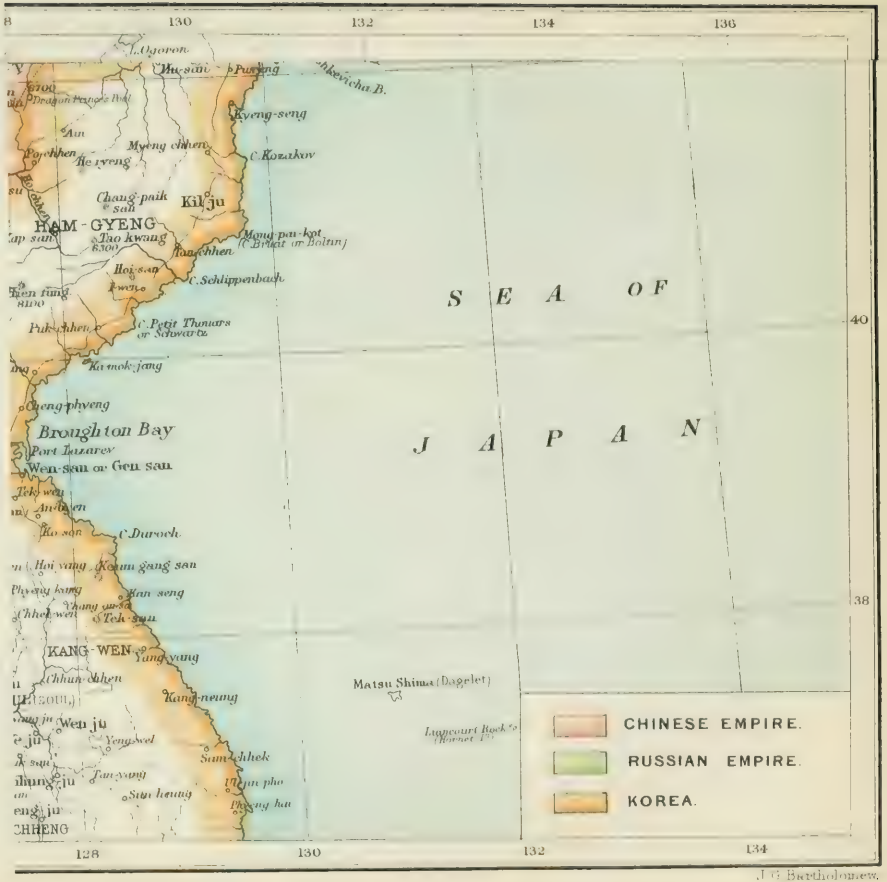
Annales de Géographie, Jan. 15, 1895.

ATLAS.

PROF. A. L. HICKMANN'S GEOGRAFISCH-STATISTISCHER TASCHEN-ATLAS.

G. Freytag und Berndt, Wien.

The forty-two sheets of this pocket Atlas contain a vast quantity and variety of information. The small form is, of course, a drawback, some of the maps being, in consequence, deficient in clearness—the map of density of population in Europe, for instance. The diagrams are a very useful feature ; here are shown, by means of parallelograms or lines of varying lengths, the relative areas of river basins, population of States, religions, commerce, mortality, railways, and telegraphs, etc. There is also a large amount of information in the letterpress at the beginning of the volume.



J. G. Bartholomew.

MAP OF
MANCHURIA
WITH CORRECTIONS BY
REV. JOHN ROSS, D.D.
Scale 1 : 6000000
English Miles
TRANS BAI KAL
Stryetensk
Nerchinsk
Nerchinskiy
HE LUNG KIANG
OR
CHICHIHAR
He lung kiang
Aigun
Blagovveshchensk
Khabarovka
Chichihar
Little Khingan Range
MANCHURIA
Tun hi valley
Hwang chang
Aldinka
Petuna
Kirin
EASTERN GOBI
Mukden
SHENG-KING
Vladivostok
Peter the Great Bay
Port Arthur
Korea Bay
Strait of Chi li
Gulf of Chi li
Miao tao
Broughton Bay
SEA OF JAPAN
YELLOW SEA
PEKING
CHINESE EMPIRE
RUSSIAN EMPIRE
KOREA

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE CAUCASIAN HIGHLANDS: A PHYSICAL, BIOLOGICAL, AND ETHNOGRAPHICAL SKETCH OF SVANETIA.

By Victor Dingelstedt,

Corr. Member R.S.G.S.

I. Physical Sketch.

The Caucasus, which extends for a length of about 750 miles, and has a breadth from 70 to 150 miles, includes many high, longitudinal valleys, formed by parallel ranges, and drained by rivers flowing for some considerable distance in the same direction. In contrast to the Alps, where art and nature have contrived so many easy passes, the Caucasian Central range, with its lofty parallel chains, has but very few practicable *cols* and only one real carriage road. The few mountain passes are blocked in winter by snow and avalanches, and in no season of the year are they without their peculiar dangers. Thus the high valleys of the Caucasus have always served as an admirable abode and a safe refuge for those peoples who only desire to live in seclusion, preserving their ancient customs and ignorant of the world's affairs. Though, with the firm establishment of the Russian domination in the Caucasus, the isolation of these valleys is less complete, and the people are constrained by degrees to issue from their natural fastnesses and take some cognisance of what is going on in the wide world, yet the process is slow, the difficulties of road-making being still very considerable, and hence, even in our days, there are tribes who continue to live just as their ancestors did a thousand years and more ago, and who care as little about telegraphs, telephones, and railways as did the Jews in times of Abraham. The upper valleys of the Ingur and Tskhenis-Tskhali, constituting Svanetia, appertain to the

most secluded Caucasian regions, and their inhabitants may be taken as the fairest example of what a people left almost exclusively to its own material and intellectual resources becomes. For this reason among others, Svanetia merits the attention of the geographer and ethnographer, though, as a matter of fact, this attention has been very sparingly bestowed hitherto, and Svanetia still remains one of the least-known countries in the world. This high mountain region has a twofold interest—physical and ethnographical. Occupying the southern declivity of the highest part of the Central Caucasian range, it presents the largest development of glacial phenomena in these mountains; it is remarkable for its vegetable and animal productions, and it has many tectonic peculiarities and manifestations of subterranean energy interesting to the geologist. Ethnography finds abundant interest in a people who were renowned in the time of Strabo, speak a very peculiar language, have preserved some of the most ancient customs, and have fully experienced the inevitable but terrible consequences of isolation from the general movement of the world and the advance of civilisation.

Svanetia may be considered as a type of several Caucasian districts, situated in profound longitudinal valleys between high, rocky ramparts, across which as yet no roads have been constructed, and therefore necessarily shut off from light and knowledge. Such spots are favourable for the growth of ignorance and superstition, cruelty and barbarism, though they may perhaps also promote the development of some of the noblest human qualities—daring, courage, love of liberty, and enthusiastic patriotism.

I feel myself justified in presenting some account of Svanetia to the British reader, as no descriptions of this country in English exist, I believe; and as the subject is surely capable of exciting some interest, I shall dwell at some length on the physical nature of the country—for certain recent researches, undertaken by members of the Caucasian Section of the I. Russian Geograph. Society have revealed some facts quite unknown before. But I shall not neglect the inhabitants of Svanetia, who, though leading a miserable existence, victims of prejudices and ignorance, cannot but arouse sympathy in the gallant struggle for existence they maintain against so many odds.

Authorities.—The first account of Svanetia in modern times was written by Brosset in 1848 (*Rapport sur un Voyage archéologique dans la Georgie et dans l'Arménie*); eight years later it was visited by Bartolomey, in 1864 by Bacradze, and soon after by Abich and Radde. Twice it has been traversed by the Swiss geologist, Ernest Favre (*Recherches géologiques dans la partie Centrale du Caucase.* Genève, 1875); and five years later some investigations were made on behalf of the Russian Government, by a geological party. The glaciers of Svanetia have been studied quite recently by Zhukoff, and its folklore and songs by Akinfieff. (*Sapiski Kavkasskavo Otdela,* 1894. *Sbornik materialof dla opissania mestnostei i plemen Kavkaza.* Tiflis, 1890).

Division.—Svanetia is situated between 43° 15′ and 44° 30′ N. latitude, and between 42° and 43° E. longitude. It is naturally divided

into two parts by a high mountain range, which runs almost parallel to the Central Caucasian range and separates the valley of the Ingur from that of the Tskhenis-Tskhali. The valley of the Ingur is in its turn divided by a transverse range, separating the Central range from Tetnult. Thus we have three parts:—the southern, along the upper Tskhenis, called Dadian Svanetia; the western, along the lower part of the upper Ingur, called Princely or Dadishkalian Svanetia; and the eastern, along the sources and upper course of the Ingur and its tributaries, called Free Svanetia. The last designation, retained even by Russians in our day, is due to the fact that the inhabitants of this part of Svanetia alone succeeded in preserving complete independence till the arrival of the Russians in 1859. And the yoke of Russia is still a very light one. In the system of Caucasian administration, Svanetia constitutes what is called a "Pristavstvo,"—the smallest administrative division, subordinated to a "District," some six or seven of which make up a "Gubernia," or "Government." Svanetia appertains to the Lechkhum District of the Kutais Government; only a "Pristav"—that is, a quite subordinate police functionary—resides within its limits, and accordingly it is practically independent.

Approaches.—The chief roads leading into Svanetia run along the course of the Tskhenis, and up the rivers Rion and Lajanuri; the former is a carriage road, which leads from Khoni to Lentekhi by way of Alpani and Tsagheri; the other leads from Kutais along the Rion up to Lailashi, and thence along the Lajanuri, the right tributary of this river, which here turns in a southward direction, up to the Rokal pass in the Dadian range, the southern limit of Svanetia. Both roads are very far from perfect, but the latter is in reality only a mountain track, accessible to courageous pedestrians and light-footed mountain horses, mules, and asses. In Svanetia itself there are really no roads, but only some tracks more or less difficult.

Area and Population.—Svanetia is some 70 miles in length, and from 15 to 20 miles in breadth; it has, therefore, an area of about 1250 square miles. Its population is variously estimated at from twelve to fifteen thousand.

Mountains.—On the north of Svanetia the Central Caucasian range forms a lofty rampart of crystalline rocks, covered with snow and glaciers, rent and crevassed into most fantastic forms, and without a single pass lower than 9850 feet. The principal summits of this chain, which so completely separates Svanetia from Cheghem and Uruschai—elevated countries on the northern declivity of the Caucasus and the eastern slope of the Elbrus, where the Malka and Baksam, affluents of the Terek, take their origin—are from west to east the following:—Tsalmag, Uzhba, Gwalda, Tetnult, Adish, and Namkwam. With the exception of Uzhba, estimated to be 15,407 feet above the sea-level, their altitudes have not been calculated. In Svanetia proper there are two parallel mountain ranges, the one dividing the valley of the Ingur from that of the Tskhenis,

the other on the southern limits of Svanetia, separating it from the Racha and Lechkhum. The former range, covered for the most part with perpetual snow, detaches itself from the Central chain near Naksagan, and forms successively the summits of Kurulash, Dadiash, Latpari, Gur, Lasul, Laila, and Lakhuri. There are many small passes across this chain, but the most frequented is that of Latpari, 5¼ miles west of Dadiash.

The second mountain range, skirting the upper valley of the Tskhenis on the south, branches off from the Central chain at Passim-mpta; it forms the water-shed between the Upper Rion and the Tskhenis, and is designated in its different parts by the names of Goribolo, Sagher, Rokal, Chitkhoro and others. Secondary or transversal ranges shooting out from the Central and lateral chains intrude into the principal or longitudinal valleys, the most noteworthy of which are those which divide the waters of the Adish and the Khalde on the one side, and those of the Adish and Mulakh on the other. The latter is an offshoot from the Tetnult, a grand mountain resembling Mont Blanc. While the Central chain on the north of Svanetia maintains its south-easterly direction, the two parallel ranges already referred to follow parallels of latitude, and the two valleys thus enclosed widen considerably at their western ends, where, possibly, there may have been lakes in former times. The mountains of Svanetia have been little explored. Russians and Caucasians are not much addicted to mountain climbing; and it must be admitted that the difficulties met with here are far more formidable than those encountered in the Alps, owing not only to the character of the mountains, but still more to the wildness of the country, and the barbarous condition of its inhabitants.[1] In spite of these obstacles, an Englishman[2] attempted in 1888 and 1890 to ascend the Uzhba, the name of which signifies "monster," and which is easily distinguished by its awkward and ungraceful outline. This attempt was only partially successful, the daring Englishman, if the popular accounts of his expedition may be trusted, reaching only a saddle between the two summits after four days of immense toil on the glaciers. I regret to say that such enterprises excite little sympathy among the majority of even educated Russians, being looked upon as a phase of English eccentricity.

Rivers.—The two principal rivers that drain Svanetia have been already mentioned, namely, the Ingur and the Tskhenis-Tskhali. The Ingur is formed by the union of three glacial torrents descending from the most elevated of the longitudinal valleys on the south side of the Central chain, between Elbrus (18,519 feet), and Adai-Khokh (15,239 feet), and called the Kwirishi, Jalai, and Medan. The first is the largest of these headwaters, and descends from the Naksaghara (8813 feet), a mountain connected with the Central chain by the western spur of the Kurulda, called the Lesghara. This ridge skirts the Kwirishi on its right bank, dividing it from the Jalai, which descends from two glaciers lying on the slopes of the Shkara and Namkwam. The Medan issues from the glacier on the Ugva, which connects the Naksaghara with the Mesghar.

Beyond the confluence of these streams, the united Ingur takes a

[1] *Journey in Svanetia*, by Akinfieff. (*Sapiski Kavkasskavo Otdela*, vol. xvi. p. 108.)

[2] Mr. T. G. Cockin.

westerly direction for some 35 miles, receiving on its right bank the waters of the following tributaries:—Chalakhi, Khalde, Adish, Muzhal, Mestia (or Mulkhra), Becho (Dodra) or Shturg, and Nakwa or Nakra. The Chalakhi issues from the glacier Tiuber, and the two following affluents from the glaciers Shkara and Gutum-tau, their watershed being formed by the Karetta and Jukmer, transversal ranges attaining 9696 feet in altitude. The rivers Muzhal and Mestia spring from the glaciers Tiuber and Gwalda, while the Becho and Nakra originate from those situated on the southern slopes of the Uzhba and Ulukol. The watershed between the Mestia and the Becho is known as the Baal mountains. The directions of all these upper affluents of the Ingur are inclined at a small angle to that of the river, and the beds of the stream are for the most part deeply excavated. There are but few and unimportant affluents on the left bank of the Ingur.

After the confluence with the Nakra, the river turns, near the village of Pari, to the south-west, leaves Svanetian territory, and after passing through a very narrow and profound rocky defile, some 40 miles long, enters the Mingrelian plain at the confluence of the Eight, near the village of Jvari. Along this part of its course the Ingur receives on its right side the Sunturi and Nenskra, the latter named in its lower course the Chuber. It is the meridional range Larak, separating the basins of the Nakra and Nenskra, which, approaching the bank of the Ingur, forces it to change its direction and enter the narrow defile, one of the most picturesque scenes in Transcaucasia. On emerging, the Ingur pursues its further course in the same south-westerly direction for about 40 miles, as far as Anaklia, where it winds slowly to the Black Sea through marshy and malarious ground. Its tributaries on the plain are the Tarak, Khube, and Eight on the right, and the Khaisht, Tsiskwa, and Natsiskwil on the left.

The valley of the Muzhal, in which are situated the communes of Muzhal, Mulakh, and Mestia, is the most beautiful and most thickly populated in Svanetia.

The second river of the country is the Tskhenis-Tskhali, or "horse river," probably so named on account of its swiftness; it is formed by three streams, the Tsena on the north, issuing from the glacier Kuruldu; the Lapuri on the south-east, from the glacier of the same name, both on the Central chain; and the Mashkhara, on the north-east, flowing from the glacier of that name. This river follows in general in a westerly direction, cutting its way through the mountain chain which, higher up, separates its basin from that of the Upper Rion, of which the Tskhenis is the most important tributary.

The chief tributaries are the Morghul and the Lefsher on the left bank, and on the right the Kheshkur, Mokhshut, and, most important of all, the Cholchula. After receiving the last-mentioned, the Tskhenis turns southward and enters the territory of Lechkhum by a narrow defile. At Muri, some 8 miles farther down, it diverges to the south-west, and, flowing some 45 miles farther in the same general direction, enters the plain of Mingrelia near Khuntsi, and joins the Rion near Orpiri on the Batum and Tiflis railway.

All the rivers of Svanetia are true mountain torrents, with very impetuous currents, and are generally full of water, though occasionally low. They break with their uproar the dead silence of the solitudes, work destruction on their way when swollen and violent, and fall in many magnificent cascades; they are of no use for navigation, even by rafts; but in the distant future they may furnish motive power for industries which at present are not even dreamt of.

Glaciers.—There are also in Svanetia many glaciers, and, indeed, as recent researches have revealed, the glacial fields and streams, though generally receding, are far more extensive in this part of the Caucasus than was formerly supposed. Some glaciers descend as low as 7500 feet above sea-level, that is, considerably below the limit of birch, sorb-apples, and rhododendrons.

The principal glaciers, in order from west to east, are the Tiuber, Tsanner, Adish (*alias* Lerkha or Lardkhat), Kkalde, and Chkhar. The Tiuber or Tviuber descends from the western flank of the Tetnult, a fine mountain, about 15,000 feet high, which also bears the Tsanner and Adish. In its upper part it is named Lychat, and in its middle course Dsynam. Its total length is about 6 miles, its breadth in its lower part 340 to 1000 yards, and its mean thickness, where it terminates in the valley of the Muzhal at an elevation of only 6664 feet, 49 yards. It takes at first a westerly direction, then turns abruptly southwards, forming a cascade, and in its middle course moves south-westwards, afterwards bending to the south down to its foot. It has a number of tributary glaciers, of which the following deserve mention:—the Laskhedar, on the east of Bashil-tau, a mile and a half long by 330 yards broad, with a cascade 160 yards high; the Iret and Tot, descending from the Gwalda, the former one and a half miles long and 300 yards broad, while the second is only half as wide and about a mile long and terminates in a splendid cascade 460 yards high; the Amashi and Seri, on the western side of the same ridge, two miles long by half a mile broad, and two and a half miles long by 620 yards broad, respectively. But the greatest of all the tributary glaciers of the Tiuber is the Kitlot, almost as long as the main glacier itself, and about 660 yards broad. Its upper part is surrounded by an almost vertical wall of the Central chain, and it falls into the main glacier on its eastern side in a cascade 370 yards in height. The three first-mentioned glacial affluents of the Tiuber have no moraines, and the other three only lateral moraines, which, in the case of the Kitlot, have partly disappeared into crevasses. The Tiuber itself has some medial moraines composed of large boulders, which run at first parallel to one another, and then, converging to the left side, terminate in an enormous pile of stones and other *débris*, which covers also all the lower part of the glacier. There are few crevasses on the upper and middle parts of the Tiuber, but below its fusion with the Kitlot the glacier is rent by very numerous fissures.

The second important glacier of Svanetia, the Tsanner, also descends from the Tetnult, or, more exactly, from that part of it which is called Jamb, opposite the head of the glacier Bezinghi, or Ulu-Chiran, on the northern side of the Central chain. It has a very extensive snow-field

(*Firn*) at its origin, whence the icy stream descends over an easy declivity for about 4 miles, then flows into a defile between lofty vertical rocks, and falls in a magnificent cascade 440 yards in height. Then it takes a westerly direction, and continues on its course, with a slight fall, for about two and a half miles more, its average breadth here being 1100 yards, when it strikes against the hill Goghish-Zaghar, which deflects it southward into a narrow defile only some 320 yards broad, where accumulated masses of ice are jammed together and thrown up into the most fantastic forms, and produce strange thundering noises as they are forced through the gorge. After an eastward course of over 7 miles, during which it attains a maximum breadth of about 1100 yards, the Tsanner terminates at an elevation of 6840 feet above sea-level. Its bulk is increased by many secondary glaciers. At an altitude of 9524 feet it is joined on the left side by the glacier called Tsanner No. 2, coming from a mountain connecting Tetnult with the Central chain ; this glacier is three and a quarter miles long and half a mile broad. Farther down, near its foot, the Tsanner receives the Nagheb, which comes from a ravine on the north-west side of Tetnult hemmed in by the ranges of the Pkarash and Lak-Chkhildar. The Nagheb is 4 miles long, with a breadth of 300 to 700 yards. The position of the lateral moraines, raised above the ice both of the tributaries of the Tsanner and of the main glacier itself, testifies to a considerable decrease of these glaciers in recent times.

The third glacier in the north-east of Svanetia is the Adish or Lardkhat (Lerkha) ; it is formed in a large *Firn*, situated between the mountains Adish (or Katyn-tau), Ghistola, and Tetnult, at about 13,594 feet above sea-level. Its upper part makes an exceedingly rapid descent, falling to the altitude of 8783 feet in a distance of only a mile and a half, while the lower section descends gently to 7448 feet above the sea. The length of the glacier is estimated at 5 miles ; its upper part is almost inaccessible ; it has lateral moraines lying far above its present level. The fourth glacier I have mentioned, the Khalde or Gheresho, flows in two branches from the Shkhara and the Janghi-tau, at a height of 8057 feet above sea-level. It is $5\frac{1}{4}$ miles long and of variable breadth —from 400 yards to nearly a mile. It runs in a broad valley, at first due south, then westwards, and finally makes a long curve to the south-west. It has, perhaps, receded even more than the other glaciers of Svanetia, and there are reasons for assuming that the decrease has taken place quite recently. I have mentioned only the glaciers in the north-eastern part of Svanetia, which have been lately investigated by M. Zhukoff, but there are also some not unimportant ice streams in the north-west, descending from the Uzhba and Gwalda, as well as some of smaller dimensions with their sources in the chain separating the basins of the Ingur and Tskhenis ; but I can give no particulars about them. The Uzhba glacier, called Gull, is almost as large as the Tiuber. There are, besides, glaciers which have been neither named nor explored, as, for instance, the two seen on the way over the Becho pass, much frequented by the Svanetians. But on the whole it must be concluded that the development of the glaciers, though considerable, is less than might reasonably be expected in this latitude and in a country so elevated.

But the glaciers had formerly, and in times not very remote, a far greater extension, as is proved by the old moraines, which cover a very wide area.

Ancient Moraines.—Numerous moraines occupy all the lower slopes of the mountain Nuamkwam (Namkwam), the small glaciers of which feed, as we have seen, the headwaters of the Ingur on its right side. They are composed of crystalline fragments, including gneiss, mica-schists, and granite. The largest villages in the communes of Ushkul, Murkmeri, and Tsuviani or Chubiani, are built on the remains of old moraines. Farther down are seen immense accumulations of boulders and erratic blocks, which, becoming rare in the vicinity of the commune of Khal, again increase some half mile above the junction of the Khalde and Ingur valleys, where they cover both flanks of the mountains to a height of 600 to 650 feet. The bottom of the Khalde valley is for some miles below the glacier encumbered with huge blocks. The same deposits cover also the headland between the Khalde and Ingur valleys. From the confluence down to the village Bosrech detritus is almost entirely absent, but it reappears where the Adish joins the Ingur. Remains of moraines also extend to a great height on the sides of the Ingur valley near the village of Zvirmiki. The spur between the Adish and Khalde is covered on both sides with boulder-clay to a height of 1000 feet. This mountain mass is traversed by a steep road, passing the foot of the Adish glacier, and at its highest point affords an admirable view of the imposing masses of Tetnult, Adish, and Nuamkwam, adorned with their crown of glaciers. The spur dividing the Adish from the Mulakh valley is also covered with boulder-clay to a height of about 1000 feet above the present level of the glaciers. There is, therefore, every indication of a far greater extent of glaciation in former days than is found in our own. I do not venture to give any opinion about the cause of the general retreat of the glaciers; to decide whether cosmic influences are at work, or whether, as is presumed by some Swiss geologists, the mountains are gradually sinking where this phenomenon is observed, or to suggest any other cause. All these are moot questions, which demand for their ultimate solution a far larger number of observations than have been made up to the present.

Geology.—The geology of Svanetia is that of the Central chain itself. This interesting subject cannot, however, be treated fully, and I shall, therefore, only say a few words on some peculiar geological features of Svanetia. The whole range forming the northern boundary of the country, that is, the Central chain between Ollukaia and Adai-Khokh, is composed of granitic rocks closely resembling in their varieties the Alpine rocks, especially in containing protogine. The Uzhba is partly formed of very fine-grained granite, yellowish felspar and quartz being equally distributed, while fine plates of black mica are disseminated through the whole mass. The various white and greenish varieties of granite sometimes resemble syenite, and are sometimes gneissose, but are always more or less markedly fine-grained. Among the components of these mountains are to be found very fine syenitic gneiss containing

yellow orthoclase, black mica in abundance, some green mica and amphibole; syenite containing minute crystals of felspar and amphibole (or hornblende), and an abundance of pegmatite or graphic granite. On the south of the granitic zone beds of crystalline schist—gneiss and mica-schist—apparently underlie the granite, and crop out in a narrow band along the flanks of the Central chain. Farther southwards clay-slate and shales appear below the crystalline rocks, showing that a complete inversion of the strata has been produced by faults, subsidence, and powerful lateral pressure, the last being an agency which had exercised a most marked influence on the orographical conformation of the whole southern declivity of the Caucasus.

The Ingur has excavated its bed along an anticlinal ridge of clay-slate, dipping north and south. These slates are of a deep grey colour, often very dark, and have usually a silky lustre, though occasionally they are dull; frequently they are very compact, and capable of being split into large laminæ. In many places, especially the Adish and Khalde valleys, are intercalated beds of lighter coloured calcareous slate, and also some arenaceous beds. The argillaceous slates contain a large quantity of pyrites, and are traversed in every direction by veins of milky white quartz one to three feet wide. Scarcely any fossils have been discovered in these sedimentary rocks, and of the few that have been found only a fucoid, found by E. Favre, has been identified and classified by him under the genus *Bythrotrophis*. Consequently the age of these rocks is still a subject of controversy; according to Abich, they pertain to the Lias, whilst E. Favre believes them to be of more ancient origin. There is as yet no definite knowledge of the age of Caucasian rocks, and no serious efforts have been made to establish their relation to the rocks of Europe.

The upper valley of the Tskhenis is sunk in shales and clay-slate of dark greyish tint. Some of the layers are soft and split easily into thin laminæ, while others are quite hard; others again break into longitudinal fragments. The general dip of the beds is north-north-east.

Of the tectonic, or structural, features of these mountains I can say but little. It has only been ascertained with certainty that the strata exhibit a great variety of arrangement, that every kind of fold and flexure is to be found among them—a complete inversion of the beds having been caused in some cases—and that in the pass of Latpari, for instance, a remarkable fan-like construction occurs.

Minerals.—The mineral wealth of Svanetia has not yet been fully investigated, but its auriferous rocks were famous in very ancient times. The Ingur valley has the familiar type of Alpine valleys between dislocated rocks, being long, narrow, and profound, with steep, almost perpendicular, sides. Owing to the steepness of its banks and the rapidity of its current in the upper section of the river, alluvial deposits are rare, being only found at the bends and at the confluences of tributaries. On the upper Ingur the place where these deposits are most extensive is near the confluence of the Eight in Mingrelia, and is called Tkabednieri. Boulders of milky white quartz, calcareous gravel,

fragments of granite, diabase and diorite, breccia, conglomerates, and porphyritic greenstone are here collected. Crystals of quartz, occurring only sporadically at the confluence of the Ingur and Sunturi, become more frequent towards the source of the river. Along the middle course, outside Svanetia, the alluvium consists principally of fine-grained sand interspersed with granitic fragments and an abundance of black and white mica. Gold in very fine scales and grains is occasionally found here, but it is naturally more abundant in the quartziferous deposits near the sources of the Ingur, where nuggets and veins of gold have been found. The quartz veins, abounding in the argillaceous shales which are the prevailing rock in the Ingur valley, may be justly called auriferous. In the Svanetian mountains occur also deposits of yellow or copper-pyrites, and half-way up the Latpari pass, the summit of which is among schists, are found iridescent shales besprinkled with small granulated crystals of iron pyrites. Other mineral wealth undoubtedly exists in the country, but it can only be investigated and exploited when good roads have been made and the country has been rather more civilised.

Climate.—No regular meteorological observations have been taken, but it may be said that the climate is characterised by a long and cold winter and a short, rainy, and very hot summer. The amount of the annual rainfall in this western part of Transcaucasia must be very considerable, and, to judge from observations recorded in certain similarly situated parts of the country, is probably rather more than 84 inches, or more than double the quantity that falls on the Lake of Geneva.

II. Biological Sketch.

Flora and Natural Productions.—As regards the Svanetian flora, the extraordinarily luxuriant vegetation in some of the lower and sheltered valleys, at an altitude of 4500 to 5000 feet, is very remarkable. By some authorities the mean elevation of Svanetia is estimated at about 6500 feet; and though this estimate is probably exaggerated, the mean can scarcely be put much lower than 6000 feet. But, in any case, the astonishing exuberance of the vegetation in some parts of the country cannot be attributed solely to favourable climatic conditions, such as humidity and sheltered situation; it is also, and to a great degree, due to the exceptional richness of the soil, composed to a large extent of the remains of plants that have grown on the same spot through many thousands of years. Underneath the living forest there is a dead forest; at every step one sees and touches immense trunks which fall and sink gradually into the earth, after having supplied the means of existence to innumerable generations of epiphytic plants—ferns, mosses, lichens, and fungi. A similar process goes on in the pasture-lands, where the tall grasses, rarely disturbed by flocks, fall after every season and restore to the earth the necessary materials for a future revival. The vegetation is at its best in the latter half of July and the first half of August.

It is difficult to give a very exact account of the Svanetian flora, botanical geography being in its infancy in the Caucasus, but its chief characteristics may be gathered from the researches of some Russian

explorers, Akinfieff, Alboff, Dinnik, and others, published by the Caucasian section of the I. R. Geog. Society, and still better from those of Dr. Levier, a learned Swiss, who visited Svanetia four years ago, and published an excellent account of his journey in the *Bibliothèque Universelle*.[1] To begin with the forests, we find that Svanetia, in happy contrast to the eastern part of the Caucasus, is still rich in dendritic vegetation. The species of trees change naturally with the altitude, but the most widespread forests are of *Coniferæ*. Between Lentekhi and Cholur, where the valley of the Tskhenis is contracted by a mountain spur which forces the river to turn at a sharp angle, the promontory is completely covered with pines as tall as are to be found anywhere, being more than 165 feet in height, or about as large as the celebrated Norfolk Island pines. These are Norway pines, which in other parts of the country give place to *Pinus orientalis*. The glades in the magnificent forest bordering the right bank of the Tskhenis abound in *Helianthus* (*Telekia*), and thick clumps of teazel (*Dipsacus strigosus*), as tall as a man, dispute the possession of the ground with the *Erigeron* of Canada. Gigantic male ferns (*Lastrea filix mas*) shoot up enormous rings of fronds to a height of 7 feet, recalling to mind the ferns of the Tropics. Here also grows in abundance *Paris incompleta*, a characteristic Caucasian plant belonging to the natural order *Trilliaceæ*. Just above Cholur, on the ascent to the Tetnar, there is a zone of brushwood—rhododendron, eglantine, hazel, apple, buckthorn, and sorb-apple—after which come tall green forests, where willows, yoke-elm, and aspens are mingled in confusion with huge beeches festooned with white threads of *Usnea* or tree-moss. The finest forests grow in sheltered situations on the banks of the Mestia; here the common box-tree (*Buxus sempervirens*), ilex (*I. aquifolium*), walnut, etc., are seen. The birch, which attains its full natural height in the lower valleys, gradually shrinks at higher latitudes and becomes a dwarf bush. Norway pines appear at first isolated, and as the elevation of the ground rises collect into larger and larger groups. Two thousand feet above Cholur blue and white aconite, as high as a mounted man, grow in large patches in the glades among the pines, and great numbers of plants belonging to many different families shoot up between the straight stems, and struggle towards the light, sending up as high as possible their inflorescence, whether in the form of umbels, panicles, cymes, spikes, or corymbs. In other glades the ground is carpeted with a medley of forms, chiefly a species of groundsel (*Senecio platyphyllus*) and Alpine sorrel, while above them an ashy-blue campanula rears its bell, and a scabious, 10 feet high, its large yellow flowers.

The *Coniferæ* predominate, in general, on the northern and eastern slopes, while trees with full leaves prefer southern and western aspects. The limits of all species are lower on the Asiatic side of the Central chain than on the northern side, the difference in the upper limits of vegetation being about 2000 feet; but this difference gradually disappears towards the eastern extremity of the range. Walnuts grow in Svanetia to an altitude of 5400 feet, vines and white mulberry to 3280 feet, the latter

[1] This account has been reprinted as a separate work under the title *A travers le Caucase*, with numerous illustrations, and is published by Attinger of Neuchâtel (1895).

attaining 40 or even 50 feet in height, with a diameter of 2 feet. Large limes and ash-trees grow at 4100 feet above sea-level. The upper limit of dendritic vegetation is considered to be about 7000 to 7500 feet; of shrubs, such as rhododendrons, 8500 feet; while pasture-lands extend up to 9000 feet.

The forests are exploited in the most wasteful and careless manner. Whenever a wood is found on a gentle slope leading down to a stream or river, wholesale destruction is at once commenced, the trees being felled and allowed to roll down into the current, which carries them to their destination. The first trunks are rolled down with some difficulty, but they soon plane down the declivity, and form a smooth slide, so that before long the ground is stripped of its covering. Some of the trunks naturally sink into the mud, where they are left to decay gradually, while others, swept aground by the current, are likewise left to perish. But all this waste is of no consequence in the eyes of the reckless Svanetian; he feels certain, if indeed he ever thinks about the matter at all, that there is enough wood for himself and his immediate descendants.

I have already mentioned some species of brush or underwood, of which there is such abundance in the forests, but before passing on to speak of the pastures, the principal source of wealth, as the country is eminently adapted for cattle-breeding, I should like to state that among the small plants are many representatives of the natural order of *Compositæ*, as *Cardaus* (thistle) and *Mulgedium*; of *Vacciniaceæ*, as Caucasian tea; of *Grossulariaceæ*, as *Ribes rubrum*; of *Actæa*, as baneberry; of *Leguminosæ*, as *Psoralea acaulis*, etc.

Of the various herbaceous plants of Svanetia it may be interesting to record the following:—a variety of *Campanula latifolia* of a dark blue colour, and of larger size than the common species; a gentian, with a lilac corolla dotted with black spots; *Inula grandiflora*, somewhat like alder; *Pyrethrum*, or feverfew, with white umbels, as high above the ground as a man; a yellow lily (*Lilium monadelphum*), the bulbs of which are exported to England. These lilies are distributed over the whole Caucasus, and are seen on high pastures, of which they constitute the most charming ornaments. At higher elevations (6500 to 7000 feet) may be seen rose-coloured starwort, betony, lousewort (*Pedicularis*), the *Anthemis* of Bieberstein, stonecrops, and houseleeks of a hundred varieties, etc.

It should be noticed that many herbaceous plants of known species, as, for instance, groundsel, aconite, *Mulgedium*, *Cephaelis*, etc., attain in Svanetia, as well as in Abkhazia and some other parts on the eastern shore of the Black Sea, an inordinate size. They might be all classified under a new genus called *Macroflora*. This unusual size must be considered, according to Dr. Levier, a heritage from very remote times, a reminiscence, as it were, of the Carboniferous age. A certain number of types characteristic of the large ancient flora have survived in the Caucasus, thanks to exceptionally favourable conditions of climate and soil, while the rest of their genera have perished. It would certainly be interesting if one could determine exactly how far this characteristic flora has remained unmodified, and could distinguish between its essential elements and those which are merely accidental or foreign to it.

In the upland pastures, where these large plants are especially abundant, we found, among others, the following interesting species :— speedwell, with blue flowers and *Telephium* leaves ; lady's mantle (*Alchemilla sericea*), which here takes the place of the *Cerastium* of the Alps ; *Centaurea macrocephala*, *Primula grandis*, and an unknown species of primrose. This is a very beautiful plant ; out of a cluster of green leaves, resembling those of the barren strawberry, shoot up straight stems, 30 inches long, crowned with umbels composed of 30 to 40 pedicels. At an altitude of 9000 to 9300 feet grow *Corydalis*, with beautiful violet flowers issuing from a long conical tube, the *Potentilla* of Ruprecht, *Cerastium* of many species, *Ranunculus Svanetica*, and a very curious speedwell with *Telephium* leaves.

Rocks and clefts have a vegetation of their own ; here flourish, among other plants, *Saxifraga cartilaginea*, *Umbilicus oppositifolius*—a rare species—*Valeriana saxicola*, *Atropa Circæa*, or enchanter's nightshade, and other peculiar varieties of low vegetation. To the above may be added numerous cryptograms, very abundant also in the forests—ferns, mosses, and fungi. The green cryptogamic flora of Svanetia, as, indeed, of the whole Caucasus, is more closely connected with that of European woods than with that of the Mediterranean region. Here, however, it is more luxuriant and more brilliant in colour, though, as far as can be judged from very incomplete observation, it contains fewer species. Dr. Levier, who has paid particular attention to cryptogams, calculates that about 400 species of moss grow in the Caucasus. Among cryptogamic plants there is a peculiar fungus, *Exobasidium*, which grows in huge reddish-yellow masses on rhododendrons and other shrubs, glueing together the extremities of the leaves and twigs, and bending down the branches with its weight. Of mosses, the *Neckera*, with its glossy leaves, and a liverwort, called *Porella*, are worthy of notice.

From among plants that thrive best near glaciers, we may select the willow herb of Dodoens, with silvery leaves when young, yellow crocus (*Scharojani*), yellow clover (*T. rytidosemium*), a pink vetch, *Rosa glutinosa*, the Caucasian honeysuckle, a glandular and glabrous brier, the fly-trap with its round-bellied calyx, wolf's claw with juniper leaves (*annotinum*), etc. Of phanerogamic plants, of which there are supposed to be about 4000 species in the Caucasus, I may mention a bitter vetch (*Orobus*), with orange-coloured flowers, *Aristolochia* or birthwort, with neither flowers nor fruit and singularly large leaves similar to those of the cyclamen of Naples. A new species of *Veronica* (*V. Svanetica*) of large growth and with sessile flowers, a globe-flower (*Trollius patulus*) white orchis, wild orange poppy, dark fritillary and white *Ornithogalum* have also been found.

It only remains now to say a few words concerning the cultivated plants. The chief cereals are wheat, rye, oats, and barley. The last is most esteemed, and is made into bread, with an admixture of beans, cheese, and wheat. The rye is chiefly used for the distillation of a very unwholesome arrack. Millet, tobacco, and a rare species of flax (*L. hypericifolium*), with large flowers three feet and a half above the ground, are also grown. Svanetians are great smokers, but their tobacco is of inferior

quality, and its consumption is further restricted by the rather heavy duty imposed by Government. There is little to be said about Svanetian husbandry, for it is of a very primitive description, and notwithstanding the sparsity of population and the extraordinary richness of the soil, famine consequent on a failure of the crops is of frequent occurrence. There is no rotation of crops, and the fields are never allowed to lie fallow; most of the ground is reserved for pasture. According to official statistics, which must, however, be accepted with caution, in eleven communes of Svanetia only 177 tons of grain are sown annually, which, taking the return as ninefold, will yield 324 pounds per head of population.

Animal World.—While the phytological geography of the Caucasus has been very inadequately studied, still less can be said of the progress of zoological geography. Science there is under official control, to the exclusion of private competition, and small results and a mere semblance of knowledge are apt to be accepted as satisfactory progress. The men who are commissioned by the government to prosecute scientific research have, it is true, in the majority of cases, passed through the regular courses of study and obtained their diplomas, but the knowledge obtained from school manuals is exclusively theoretical and often very superficial; and as no university or other learned body controls and verifies the official reports, these often contain a quantity of incongruous matter, erudite in appearance and bristling with obtruse scientific terms, but conveying no solid information on the subject.

There is probably no essential difference between the fauna of Svanetia and that of the higher Alps, as only in the South-Eastern Caucasus are distinctly Asiatic representatives of the animal world to be found, such as the tiger and panther. The mouflon (*Ovis musimon*), argali (*Ovis Ammon*), and aurochs (*Bos urus*) dwell here, as well as the chamois (*Antilope rupicapra*), roebuck (*Capreolus capræa*), a goat very like *Capra ægagrus*, wild boars, beavers, and weasels, quail, grouse, moor-hen and blackcock (*Megaloperdix Caucasica*). Other birds worth mentioning are the yellow-hammer and ortolan (*Emberiza citrinella* and *hortulana*), the butcher-bird (*Lanius collurio*), finches (*Fringilla coelebs*, *nivalis* and *spinus*), the swallow and house-martin (*Hirundo rustica* and *urbica*), the grey wagtail (*Motacilla alba*), the shore lark (*Alauda alpestris*), a warbler (*Accentor alpinus*), the thrush and bullfinch (*Pyrrhula erythina* and *rubicilla*). The number of birds of prey, such as eagle, vulture, hawk, kite, buzzard, and owl, is considerable.

The cold swift streams of Svanetia contain excellent trout (*Salmo trutta* and *fario*) and *Cyprinus mystaceus*.

The insect world is remarkably abundant, especially the order of *Coleoptera*. Specimens of the following genera and species have been observed:—*Prionidæ*, *Hamotoceras*, *Buprestidæ*, *Melolontha*, *Lucanus*, *Mordella*, *Cryptocephalus*, *Clythra*, *Nebria*, *Strangalia*, *Leptura*, *Cetonia* (*C. aurata*,) *Cerambyx*, *Lampyris*, *Orthoptera*, *Hister* and *Ontrophaga*. Flies and lice are innumerable, gadflies and mosquitoes being excessively troublesome. Among the butterflies are met with the famous *Apollo* and also members

of the genera and species *Argynnis, Doritis, Zygæne, Hipparchia, Geometridæ, Colias.* There are also several snakes, among them the viper, *Pelias berus.*

But of far greater interest are the domestic animals, especially those of the bovine order, for, as already stated, the Svanetians are eminently a pastoral people. Svanetian cattle are noted in Western Transcaucasia for their superior qualities. There are two principal breeds; one is small, but active and lively, firm on its feet, and able to climb the steepest paths; the other, strong and solid, with peculiar hair like a tiger's, has been introduced by Tartars from the Ukraine. Unfortunately both breeds are equally subject to frequent attacks of foot-and-mouth disease, pleuro-pneumonia, etc., which work terrible havoc among them, as also among the sheep, goats, and pigs. Svanetian sheep, all broad-tailed (*Ovis laticauda*), are also highly prized. The Svanetian is a great consumer of mutton. The horses are few, and are used only for riding; they are of light build and hardy. The mules and asses, also used to a great extent for riding, are considered as the best of Caucasian breeds.

While speaking of domestic animals, we must not forget the dogs, genuine sheep-dogs, useful and very faithful to their masters, but extremely ferocious to strangers; they are really dangerous to travellers in Svanetia, for they will furiously attack even horsemen, and are more feared than wolves and bears. The danger is the greater because the proprietors are strongly inclined to resent any serious injury to their dogs, even in legitimate self-defence. The Svanetian is terrible when roused to anger; but of this, as well as of his more amiable qualities, I shall speak in the next and concluding part of my article.

III. Ethnographical Sketch.

Origin and External Appearance of the People.—The Svanetians are of ancient origin, and were formerly a powerful people. Strabo, in his *Geography*, speaks of them as courageous and warlike, and as living near Dioscurias. They are far more powerful, he says, than the Phtirophagi, and also more unclean; "their courage is above that of all other peoples." Their territory in former times was certainly far more extensive than at present; they dwelt to the end of the fourteenth century principally in the upper valley of the Rion, whence they constantly menaced the more peaceful people of the plain. But most of old Svanetia was at last conquered by the Mingrelian princes, and the majority of the people had to seek refuge from Mingrelian oppression in the almost inaccessible regions of their present abode. The Svanetians of to-day are, therefore, mostly descendants of fugitives and malcontents from the upper valley of the Rion and other parts of Mingrelia and Georgia. Their relation to those kingdoms may have been approximately of the same nature as that of the Ukraine Cossacks to the Russian princes, when the latter began to establish order in their dominions. The Svanetians who established themselves in the upper Ingur valley were especially successful in their endeavour to keep themselves free from a foreign yoke; for, whilst the inhabitants of the upper Tskhenis-Tskhali submitted to the princely house

of the Dadiani, and those of the lower Ingur were forced to acknowledge the supremacy of the Dadishkaliani, they alone remained practically independent, and even now, though completely subjugated by Russia, they rejoice in the title of "Free" Svanetians.

The majority of the present inhabitants of Svanetia are, accordingly, of Kartvelian, or rather Mingrelian, origin, though the race has been mixed with a number of other nationalities; Jews and Tartars also live among them. On the whole, they are not prepossessing in appearance, having a somewhat short stature and irregular features. By some writers they are described as positively ugly and unkempt, with heads generally mesocephalic or brachycephalic, and small blinking eyes, and not unfrequently rendered still more hideous by several enormous folds of flesh produced by goitre, to which they are often victims. They have maintained their old reputation for uncleanliness, and, in this respect, contrast strongly with their handsome Mingrelian neighbours. The women are usually plain, thin, dull, and apathetic, but they differ considerably according to the tribe, or even commune, to which they belong.

Language.—There is still much controversy about the Svanetian language. Caucasian philologists place it, with Georgian, Mingrelian, and Laza, among the Kartvelian or Iberian group, which with half-a-dozen other, mostly unwritten, idioms (Abkhasian, Ubykh, Cherkessian in the western, and Lesghian, Talysh, and Chechen in the eastern, part of the range) constitute the so-called Caucasian languages, apparently quite distinct from all other languages in the world. The relationship between the various languages of the Kartvelian group has not yet been accurately determined, for it is only quite recently that, thanks to the efforts of M. Yanofski, chief of the Caucasian Department of Public Instruction, the necessary material for investigation has begun to be gathered in. Even the classification of Svanetian in the Kartvelian group is far from being generally accepted, and there are eminent specialists, such as the historian Brosset, who positively deny its correctness. M. Zagarelli, Professor of Georgian at the University of St. Petersburg, after a comparative study of the Kartvelian languages, has come to the conclusion that the etymological forms of Svanetian have a very remote connection with those of other members of the group. Indeed the relationship of this group itself remains an enigma, some philologists including it in the Aryan family, others in the Semitic, while others again assign it some unknown source (perhaps Kushin[1]). The Svanetians cannot understand Georgian, and certainly their language is nearer akin to Mingrelian, though it contains many words of a totally distinct origin. It is very guttural and has few labial sounds. Greatly to the credit of the people who speak it, the language contains hardly any terms of abuse, contrasting in this respect with Russian and English. Baron Usslar, who has rendered such signal service to the philology of most Caucasian vernacular languages,

[1] There are reasons for believing that the Colchians were for long in intimate connection with the Georgians. These Colchians, who occupied large tracts on the southern shore of the Black Sea in pre-Hellenic times, are supposed to have been of Kushit or Turkmanian origin.

has made a transcription of Svanetian, which has no alphabet of its own, in Georgian characters, which he considers the best for literary purposes, and this transcription has since been transliterated into Russian, with the retention of some Georgian characters. In Svanetian 37 sounds are distinguished, of which 8 are vowels and 29 consonants. Among the latter are 7 hard guttural sounds, 3 dental, 3 sibilant, 3 labial, 1 labio-dental, 1 soft palatal, 1 aspirate, 2 liquids, 1 labio-nasal, 1 dento-nasal, and, lastly, 6 double consonants, such as *ts*, *ch*, *ds*. Among the vowels, besides the ordinary *a*, *e*, *i*, *o*, *u*, there are two modifications of *o* and a sound resembling the English *w*, but there is nothing to correspond with the Russian bI (*y*).

To give some notion of the character of the language I here subjoin a dozen Svanetian names of common trees :—

Ghoghib,	Pine.	*Baghura*,	Willow.
Ghunnar,	Fir.	*Tskumra*,	Elm.
Dshkhera,	Juniper.	*Bizikh*,	Pear.
Kwari,	Rose.	*Boelkoesh*,	Alder.
Tsipra,	Beech.	*Geokiora*,	Birch.
Shtukhund,	Hazel.	*Jigra*,	Oak.
Zhekhura,	Aspen.	*Kwich*,	Chestnut.

Religion.—Christianity was introduced into Svanetia at the same time as into Georgia, that is, in the middle of the fourth century; and during the long persecutions which the adherents of that creed endured at the hands of the disciples of Zoroaster, and afterwards of the Mohammedans, the glens and gorges of Svanetia served them for a place of refuge. Consequently a number of churches were constructed there, which are of deep archæological interest as showing the spirit which animated the ancestors of the present inhabitants of the country, whose religious zeal has considerably abated. Though Svanetians affirm that they have been baptized by Christ himself, they care little for Christianity, and much prefer the religious rites sprung from ignorance and an undefined dread of the powers of nature, which they have inherited from numerous other tribes. Though nominally members of the Greek or Orthodox Church, and though their spiritual needs are provided for by officially appointed Georgian popes, who chant the mass in their own language which is not understood by their flocks, the Svanetians do not as a rule baptize their children, do not frequent the churches or partake of the Holy Communion, save on their death-beds, nor keep in their churches sacred images like their orthodox brethren. These are replaced by a number of mouflon and argali horns. Other sacred objects contained in the churches are brazen trumpets, which formerly served the purpose of bells, but now are used only on solemn occasions. The religious edifices themselves are poor and small hexagonal or octagonal buildings, with a narrow lancet window-opening at the eastern end, and a low door in the opposite wall, and cannot hold more than a score of persons besides the priest. Perhaps the smallness of these chapels is the reason why women are rigidly excluded except at weddings. The Svanetian clergy are a poor and ignorant caste, whose sole privilege is exemption from the

terrible laws of vendetta. The Svanetians have preserved from pre-Christian times the practice of sacrificing to divers malevolent and benevolent spirits in order to bring about the success or failure of any particular enterprise; they venerate the Holy Virgin, and, in common with most Asiatic peoples, dread above all things the displeasure of the spirits of their deceased relations and friends. Naturally idle and improvident, owing to ignorance and the depressing effect of a cold climate, they are ready enough to observe the holidays sanctioned or enjoined by religions other than their own. They scrupulously abstain from work on Sundays, Mondays, Fridays and Saturdays, but, in spite of this, they do not keep on very good terms either with the Jews, who inhabit some communes in the Tskhenis valley, or with the Tartars on the northern slope of the main chain; with the latter, indeed, who perhaps have encroached on the Svanetian lands, they are in constant feud.

The Svanetians firmly believe in the existence of the soul after death. The soul is supposed to reside in the house of the deceased for at least a year after death, and to require during that time everything the body was accustomed to in life. Therefore the relations after every repast place some remnants of food in the darkest corner of the room, with a glass of brandy and a pipe of tobacco. These pious offerings are afterwards consumed by the children. In direct opposition to the views of many Christian peoples, the Svanetian believes that the greater material comforts a man has enjoyed on earth, the more agreeable will be his life in heaven, but, far from acting in accordance with this belief, he is perhaps, of all people the most negligent in providing for his own well-being, though most attentive to the wants of his departed relations. Funeral rites are of special importance, for it is generally believed that if the kindred of the deceased neglect their due observance, the spirit of the departed will wreak vengeance on them. Curious results follow from this fear of vengeance; distrustful old people arrange their own funeral ceremonies while alive, and, by thus representing themselves as dead before their time, they hope to secure peace to their souls when delivered from the body. The man whose funeral rites are to be performed invites his friends and relations, dons his best garment, and eats and drinks as much as he can, while the invited guests behave as in the presence of a corpse, howling, crying, and wailing with every outward sign of despair. Meanwhile the imaginary deceased observes attentively all that goes on, noting which of his relatives seems most sincerely grieved, that his soul may in the future repay him by promoting his welfare.

The Svanetians reverence the sun and the celestial bodies, and swear by them; they have also a superstitious respect for oxen and cats, and they exorcise the evil spirits which are supposed to cause disease.

Culture and Industrial Arts.—In general culture and in arts the people are very backward. There are no schools, and all that a poor Svanetian can learn comes to him from his own experience in life and his limited knowledge of his surroundings. Most of the villages (*aul*) are situated in such narrow and profound gorges that, looked at from an eminence, they appear quite inaccessible. Even in summer, with a clear

sky, the sun illumines these abodes only for a few short hours, while in the long severe winter there is little light, except what is reflected from the white snow, by which the poor Svanetians can work in their hovels. There is hardly any communication between these isolated *auls*. They are arranged in polygons, with thick walls without and narrow passages within, and are fortified, those at high elevations more strongly than those lower down. Outwardly these *auls* have a very picturesque appearance. The chief feature in their fortification are old, half-ruined towers. The upper parts of these towers are covered with a slightly sloping roof, and project over the lower parts, which they command by means of four loopholes. They have a height on an average of about 70 feet, and are fairly strongly built of rough stones bound together by cement. But these strong erections are vestiges of a former art of masonry unknown to the present generation. Now only miserable stone hovels are set up in a far less skilful manner, without cement and almost without tools. An irregular quadrilateral, with small apertures in lieu of windows, and divided into a ground floor and a garret, is piled up against the face of a tower and roofed with slates or slabs of stone. Within, these hovels are exceedingly repulsive, filthy, dark, and bare; few have any furniture properly so called, containing only vessels and other utensils, horns, wooden cups, and plates, hollowed tree trunks, etc. Dark and squalid dens are these dwellings, full of heaps of rags, dirt, and disorder, swarming with all kinds of vermin, which were always the companions of man in prehistoric times, and without which a true Svanetian would feel quite uncomfortable. Life in these dens during a long and rigorous winter must be terrible indeed, and goes far to explain the general abuse of arrack, the prevalence of goitre and idiocy, and the manifest degeneration of the inhabitants of this poor forgotten and forsaken corner of the world. The Svanetian house or *khor* has no chimney; a hearth is built of slates in an excavation in the middle of the house, and serves as a bread oven. Cattle, children, men and women are all huddled together on the ground floor during winter, while in summer the cattle are driven off to the pastures, and the family live somewhat more comfortably in the garret or *darbas*, into which light and air can penetrate freely through the numerous interstices of the roof. In winter the garret is used as a store-room for fodder and adds much to the risk of fire.

Agriculture of a primitive kind, cattle-breeding, hunting, and apiculture to a small extent, are the only industries. In this respect the natives of Svanetia are far behind many negro tribes of Central Africa, for they do not manufacture even earthenware, and they are unacquainted with many tools employed in primitive times. Their intellectual powers are of a low order. A Russian traveller once had to pay through the medium of his interpreter a sum of money to a number of Svanetians in compensation for services rendered by them in common to himself and his companions, and he relates the difficulties that arose in apportioning this money between the partners to the satisfaction of all. The dispute which ensued was only settled by recurring to the customary method of calculation by means of pebbles. It has also been stated that Svanetians

demand the same price whatever may be the size of the article offered for sale, asking, for instance, the same sum for a fowl and a chicken, for a sheep and a lamb; and they always hold out for a price they have once obtained, though the circumstances of the market may have changed completely. Trade, indeed, is not much further advanced than industries. There are no shops or warehouses in the country, no commercial classes, no money: only barter. A man wanting to buy or sell anything transacts his business without the intervention of a middleman, betaking himself to the place where he expects to make the best bargain. A Svanetian will cross rocky mountains, snow-fields, and crevassed glaciers in the worst season to barter a handful of pears or apples for meat and grain with the Karachai Tartars on the other side of the main range. Travelling is always difficult. In summer riding is the most common mode of progression; in winter the natives mount the hills on foot and descend on light sledges or toboggan on their sheepskins or felt mantles (*burka*). Sledges consisting of a small basket mounted on a pair of runners are also used in summer.

Dress and Food.—The Svanetians have no distinct national costume. Their want of cleanliness, on which I have already remarked, is such that they do not care to wash their under-garments, when they have any, and a shirt, once put on, is never replaced as long as threads enough remain to hang together. The men wear the usual Caucasian costume—a long close tunic (*beshmet*), an upper coat (*cherkessku* or *phsar*) with cartridge cases arranged on both breasts, and narrow trousers (*shalbar*) ending in pointed moccasins (*khabury*) made of undressed hide, with soles, and stuffed with grass. The head is covered with a rough, undyed felt cap of a very simple pattern. Both in winter and in summer the dirty *kish* or sheepskin is almost always on their shoulders. In contrast to the other Caucasian highlanders who, while caring little for home comforts, compensate themselves by attention to their personal appearance, and are fond of good and handsome dress, the Svanetians are quite indifferent to their attire. The women also dress very simply, some like the peasants of Little Russia, others, according to Georgian fashion, in a loose black gown, full behind and very open in front and sometimes embroidered or laced. At home a long chemise and a handkerchief is the women's usual costume. The poor (and they are almost all poor) strip off everything at night, and, as they have no bed-clothes, keep themselves warm by sleeping in sacks filled with chopped straw.

Mutton, coarse meal, and sour milk are the chief articles of diet among the well-to-do, but the true national food is simply bread and bad cheese, washed down with as much arrack as there are means to procure.

Morality.—We do not pretend to know the Svanetians well enough to judge their morals fairly. Certainly they habitually commit with a quiet conscience acts which we consider immoral—perjury, larceny, and retaliation; but, as morality consists in acting according to one's notions of right and wrong, it may be that the standard of morals is higher than in far more civilised countries, that is, the laws of morality may be not so often

consciously transgressed. In the absence of criminal statistics it is impossible to decide the question, but it is certain that the Svanetians faithfully obey the behests handed down from their ancestors and upheld by the elders of the community. They show much zeal in the commemoration of departed spirits, and in the observance of all other prescribed customs, especially with regard to exacting vengeance for manslaughter. There is no great purity in the intercourse of the sexes, especially between brothers- and sisters-in-law, but, according to many testimonies, the Svanetian may, on the whole, be called a respectable character.

"Free" Svanetians are rather rougher and more savage than their brethren in the Svanetian Principality; their beards and garments are, if possible, more neglected, their features are harder, and their dispositions more distrustful, the rude climate and the wild surroundings of their home being less favourable to the development of amiable qualities.

Social organisation.—Though they acknowledge the Russian Government and obey its commands on the rare occasions of its interference, principally connected with the levying of some light duties, the Svanetians are practically their own masters. The basis of their society is the self-governed commune, and the individual members are firmly linked together by the bond of strong tribal or communal feeling. The commune is of much greater importance than the family, and the obligation to perform the duties relating to it is much more binding on the conscience. To every family meeting or festivity most of the members of the commune are invited. This peculiarity, so strongly opposed to the family spirit and individual independence of Western civilisation, is alone almost a sufficient proof of the Asiatic origin of the race. The Svanetian community exhibits a thorough unity of purpose, traditions, and interests. The social authority is vested in the elders of the commune, just as that of the family is in its head. Members of the same commune consider themselves brothers, and embrace and kiss one another, even though of different sexes, when they meet on a journey or at some festivity. At funerals, baptisms, and indeed all events in which not the whole commune but a family or individual is immediately interested, all the members of the commune meet together as of the same kindred, while those of other communes are looked upon as strangers. Pasture lands are always grazed in common, but forest and arable lands are often divided among the families. Expenses incurred by a family in the exercise of hospitality are discharged by the community at large.

The population of Svanetia is estimated in round numbers at 15,000, distributed among eleven communes. Considering the exclusive spirit which animates each commune, it is no wonder that considerable variety in appearance and general bearing is observable among individuals of different communes; and, in fact, the difference is so marked, that an experienced eye can easily recognise a man from any particular community. In Uskhul the men are tall, dark, slender, and graceful, while in Mestia they are fair and stout, with full beards and bright, restless eyes. In Mulakh, again, are individuals wonderfully like Little Russians—stern,

surly, cunning, heavy in gait, wearing long moustaches, and never seen without a pipe. In some communes, as Lakmul, the inhabitants have decidedly Jewish features; in others the Mongolian, the Gypsy, or the Georgian type is most marked. Ignorance, superstition, indolence, slovenliness, and an irascible, revengeful spirit are common to all, but a common physical type is not easily evolved out of this mixture of races.

Each commune consists of some villages and hamlets and isolated farms. The population is very unequally distributed. The most densely peopled district lies to the north of a small longitudinal chain which separates the wild valley of the Upper Ingur from the broad and cheerful basin of its eastern affluent, the Mulkhra or Mestia. Here is the commune of the same name, the richest of all. But, rich or poor, they are autonomous. All local affairs are debated in public meetings held in the open air, at which every adult member has an equal voice, and as in the Polish diet, and in certain small quasi-republics of Shinaki' (on both banks of the Indus below Bunji), all resolutions must be carried unanimously. But, while all business of general interest is transacted at communal meetings, personal disputes and assaults, even though they end in manslaughter, are left to be settled by private arrangement according to the ancient unwritten *lex talionis*. The Russian Government is steadily endeavouring to suppress this barbarous custom, but its efforts are paralysed by the absence of roads.

The Family and the Position of Women.—The ties of relationship in every degree are thoroughly respected by the Svanetians, strengthened as they are by the adoration of ancestors and the authority of the head and elders of the family. Possessing but very precarious means of subsistence, the Svanetians do not, however, care to have large families, and until quite recently—if, indeed, it is not continued at the present day, which is difficult to ascertain—the cruel practice was in vogue of killing superfluous children of the female sex. This is, perhaps, one of the reasons why there are about 10 per cent. fewer women than men. Svanetians marry very young—girls at the age of 12 or 13, boys at 16. Notwithstanding the scarcity of women, a widow seldom enters a second time into matrimony. As the family fortune goes after the death of the husband to the children, the widow has nothing to offer but herself, which in most cases is apparently not sufficient attraction. Marriage is confined almost exclusively to persons of the same commune, and to this, and abuse of arrack, the degeneration of the race is probably due. The bride is bought by the bridegroom from her parents, the price (*nachvlash* or *kalym*) being a cow, a horse, or a few sheep. The bride, on her part, is expected to bring to her new home some kitchen utensils or a quantity of manure.

The family still retains its patriarchal character, the head of the family being supreme, and all the other members owing him obedience, and not venturing even to leave home without his permission. Marriage contracts and all other important affairs are always discussed in a family council. The position of a woman, though inferior to that of the men, is on the whole tolerable; she is respected at home and abroad; she has

sometimes a voice at public meetings as proxy for her absent husband or brother, and goes about freely with her face uncovered.

Children are often betrothed in childhood, the parents of the bridegroom giving to those of the bride a small sum of money or a ball as a pledge for the fulfilment of the contract. Such engagements may be made by the parents even before the birth of the children. When the parties concerned have reached a marriageable age, the parents of the bride demand the *nachvlash*, that is, the cattle for which she is sold. Here, as in France, women are at the bottom of most of the quarrels, and these disputes are the more common owing to the dearth of women. Feuds, not infrequently terminating tragically, generally arise from one of the parties being deceived in its expectations or from reluctance to pay the *nachvlash*.

Customs.—I have already said that the Svanetians faithfully observe their ancient customs. These have reference to the commemoration of the dead, marriage, hunting, hospitality, and the avenging of blood. Drinking and brawling are inseparable accompaniments of all festivities.

Funeral Obsequies.—Sick and dying persons are diligently tended by their relations and neighbours, who bring them strong spirits (arrack) and food. The excessive use of alcoholic drinks kills many sick persons who might otherwise recover. As soon as a man is dead, his friends flock together from all parts of the commune, and, surrounding the bed of the deceased, give expression to their grief by loud wailing, the men and women gathering together into separate groups and the latter making the greater noise. The virtues and good deeds of the deceased are enumerated in plaintive tones, as well as those of his forefathers, and the circumstances attending the fatal illness of the departed and his invariable fortitude under suffering are all recapitulated in minute detail. On the third day after death the corpse is placed in a bier, consisting of two halves of a hollow trunk, or is simply wrapped in a cloth, and is carried to the burial-ground preceded by a calf or a sheep, the fee of the officiating priest. After the body has been lowered into the grave, the mourners, kneeling reverently, intone an ancient formula in which each expresses his grief by cursing the day he was born. The ceremony over, all repair to the house of the deceased, where a copious repast awaits them, and often terminate their carouse with a serious scuffle. This custom of feasting at funerals entails heavy expenses on the bereaved family, and thus contributes to the general impoverishment.

Later on come the commemoration ceremonies, almost as costly as the funerals. The first takes place twelve months after the death, and the solemnities are renewed after a lapse of five and ten years. Eating, drinking, quarrelling and fighting are uniformly indulged in. All this is done in the belief that, the more lavish the expense, the greater will be the number of sins forgiven to the deceased, and the more the power of the departed spirit will be exerted in favour of his surviving relatives. Social gatherings and festivities also take place on the occasion of a wedding, a saint's day (particularly that of St. George), or to commemorate

any other important event, and are so many opportunities for undermining fortune and health by excessive drinking. Singing and dancing form part of these entertainments.

Singing and Dancing.—The Svanetians are fond of singing in chorus, and the result is a strange cacophony. Sometimes, indeed, amid a terrible dissonance and an appalling clamour of voices, one may perceive something recalling a not unfamiliar melody; but the charm is quickly dispelled by a vociferous noise, in which a major-third, a seventh, and a false fifth engage in mortal combat, while above the general din of this savage rhapsody a high falsetto bursts out like the yelling of witches burning at the stake. Sometimes a high shrieking voice starts a refrain, which is responded to by a chorus always ending abruptly in a wild roar. The instrumental music is more agreeable to the European ear than the vocal. It is not so noisy. The national instrument, the *chuuir*, has a very slight resemblance to a violin. Its construction is simple; a dry ox bladder is tightly stretched over the hoop of a common sieve, and across it are strung hempen threads slightly smeared with pitch, which are set in vibration by a bow of horsehair. The tone of the instrument is sweet and melodious. It is used chiefly to accompany singing.

Dancing also is a favourite pastime, but as practised in Svanetia is very dull and tame. There are round and solo dances. In the execution of the former the men range themselves in a circle and move, not round, but only from side to side, tossing one foot after the other with wearisome monotony. In the solo dance, which is something like the renowned Lesghinka, without the gracefulness and the charming rapidity of motion that distinguish it in Georgia, both men and women take part alternately.

Superstitions.—Svanetians, still disposed, in spite of their nominal Christianity, to see in all manifestations of nature the work of as many independent and powerful spirits, benevolent or mischievous, are naturally addicted to many superstitious rites intended to conciliate the former and exorcise the latter. Sacrifices and ceremonies are performed with the object of increasing the number of the cattle, of procuring a good harvest, of curing a disease or warding off the attack of an enemy. Especial precautions are taken to ensure success in the chase, which is considered a hallowed enterprise. A hunter must be a man of unimpeachable character; before going to the chase, as before any other important enterprise, he must keep silent, must betake himself to the hunting-ground with the greatest secrecy, especially avoiding all communication with women, and on arriving there must, before all things, offer a sacrifice to the goddess of the chase, called "Dal" and represented like Diana in the form of a beautiful woman.

Sanitation.—It must be pretty evident from the preceding remarks that, mountain air and excellent water notwithstanding, the Svanetians do not live under favourable sanitary conditions, confinement in miserable hovels, bad food, insufficient protection from cold, and abuse of alcoholic drinks,

all conspiring to annihilate the good effects of a healthy climate. Even without the guidance of sanitary statistics, one must form a very unfavourable opinion of the sanitary state of the poor Svanetians. Malaria, anæmia, dyspepsia, rheumatism and many other common diseases are rife among them, and, unfortunately, there are, besides, some rarer and more terrible disorders, such as cretinism, and, according to some authorities, leprosy. Goitre is very prevalent, usually accompanying or producing cretinism. The swelling on the front of the neck not infrequently attains the size of a child's head. In the upper Tskhenis valley almost the whole population is afflicted with this revolting complaint. It springs from the abuse of arrack, according to Dr. Olderoga, who was commissioned by the Russian Government to inquire into the causes of this scourge, and also of cretinism. For my part, I should attribute it to poverty and the wretched existence of the people in general.

Folklore.—I will conclude this study of the Svanetians by a few words on their other principal solace, besides arrack, in their gloomy and uneventful life, one, moreover, which calls their imagination into play. In the absence of literature, folklore affords some useful indications of the character of a people. Valuable materials have been recently collected, under the auspices of the Educational Department of the Caucasus, by school teachers. Svanetian fairy tales, legends, proverbs, songs, and enigmas have been translated into Russian, and have thus been added to the rich stores already acquired in this branch of literature. In perusing these creations of Svanetian imagination, one is much struck with their resemblance to similar productions in other countries, European, Asiatic, and African. Here we find, as elsewhere, spirits or demons representing the forces of nature, national heroes lauded for their deeds of valour, the beauty of national heroines extolled, and the practice of virtue recommended as contributing to success in life. I cannot, indeed, enter into particulars on these subjects, but I should like in conclusion to relate the Svanetian account of the creation of the world and of the work of redemption.

"There was a time," says the legend, "when there was nothing but water, out of the midst of which rose a high rock, wherein God was confined. Disliking to remain buried in solitude, God burst the rock, rending it for a length of eight miles, and came out. The mingled water and earth round the base of the rock God divided into two parts, forming the heavens from the one and the habitable world from the other. But as yet there was no living being. Then God wept from weariness, and lo! the tear from the right eye became the angel Michael, and that from the left Gabriel. Many ages passed away, and then, at the command of God, animals and men were created, and God and His angels walked upon the earth. One day they met a young man and asked him 'Where are the men of thy tribe?' 'They have gone to pick a quarrel.' 'How?' 'They have gone to enclose a field, and as the fence is sure to be thrown down, a quarrel will follow. It would be better for us to leave the field as it is.' 'And where are thy women?' 'They have gone to earn tears.' 'What dost thou mean?' 'A neighbour has died, and they are

gone to bewail him, so that, if any one dies amongst us, the wives of our neighbours may come to bewail our lost kinsman.' Many other questions were put to the youth, all of which he answered very discreetly, and God was so pleased with him that he took him to Himself. The name of the youth was George. God and His angels travelled much over the world on their wonderful horses, and wherever they went dry land appeared. One day they perceived a big stone in the distance, white as snow, and God wished to go up to it, but His three companions led Him astray. He turned back and tried again to approach the stone, but the angels led Him astray a second time. Then said God to His angels, 'Ye have played me some trick, or we should certainly have found this white stone.' 'Well,' said the angels, 'we will lead thee to the stone, but we believe that evil and loss will befall us.' Then they rode up to the stone, and God smote it with His whip, and the stone was broken asunder, and Satan (*Samal*) came forth. Satan forthwith seized God's horse, and God cried for help. Then the angels surrounded Satan, and asked him who he was and what were his powers. Satan said to God, 'Thou and I have both been in the heart of the stone; we are both of the same origin; I am of the core of the stone as thou art, wherefore let me have part of the world.' God bid His angels consider the request of Satan. And then they divided everything into three parts, living men forming one part, the souls of the dead another, and animals and birds the third. God took the men and brutes, and Satan men's souls, but under certain conditions. The angels said to Satan, 'Be not overmuch puffed up. Thou shalt keep men's souls only till the time when a son shall be born to God, who will deliver them from thy dominion.' And Satan answered, 'All is well. It will be long ere God has a son, and in the meantime I shall have gathered in souls enough.' Then Satan built Hell, and surrounded it with a wall, leaving only one small aperture to admit souls, and in it dwelt a multitude of devils who, at the bidding of Satan, tormented the souls in all manner of ways. Ages rolled by, and at length the time arrived when a son should be born to God. God pitied the souls of men, and wished to fulfil the compact made with Satan at the division of the world. God then assembled His angels in council, and each gave his opinion, and one angel said that he knew an upright couple who had a daughter named Mary. Then God took an apple and blew His soul into it and gave it to the angels. And they took the apple and went to the house of Mary. Now there was in the country no girl so good as Mary. When the angels arrived at the house, Mary was absent; she was washing her linen at a fountain, and thither the angels followed her. The angel Gabriel threw the apple towards her without showing himself, and Mary took the apple and, having bitten it thrice, laid it in her bosom. Then Gabriel appeared unto her and declared that by the apple she should conceive and bear a son, and that she should be careful not to offend God in anywise. And his saying was accomplished, and Christ grew up quickly, and all marvelled at His understanding. He made the people to know the true God and His commandments. Twice He said in His discourse, 'We have to carry much sand.'[1] And one of His disciples answered, 'We do not

[1] That is, a Herculean task to perform.

understand the meaning of these words. Explain them, Master, and we will do as thou sayest.' Then Christ said, 'Follow Me.' All followed Him, and He brought them to Hell, and He destroyed it, letting out all the dead into Paradise, which God had made meanwhile. Thus Christ vanquished Satan and destroyed his kingdom."

THE BALTIC AND NORTH SEA CANAL.

THE great engineering work which will allow the largest vessels to pass directly from the North Sea to the harbour of Kiel, without making a long detour round the north of Denmark, is now completed, and will be formally opened on the 19th of this month. The saying that "there is nothing new under the sun" is true in this case. Vice-Admiral Batsch[1] considers the tradition that a plan for cutting through the Cimbrian peninsula was proposed in the fourteenth century as unworthy of credit, on the ground that Waldemar Atterdag of Denmark was not likely to permit his rival, the Great Gerd of Schleswig and Holstein, to thus avoid the necessity of passing through Danish waters; nor was his successor, Margaret, likely to show such favours to the duchies. The first work of this description was the Stecknitz canal, built at the end of the fourteenth century, to bring the capital of the Hanseatic league into immediate connection with Hamburg, but it was navigable only by vessels of small draught, and its projected enlargement was never executed; it is still in use. In later times, the control of the Sound and Belts held by Copenhagen was felt so keenly by other seafaring nations, that Cromwell turned his attention to the formation of a canal from Wismar through the lake of Schwerin into the Elbe, while the people of Lübeck, in conjunction with Holland, entertained a scheme of enlarging and prolonging the Stecknitz canal. These projects were abandoned owing to the death of the Protector and the interference of the King of Denmark.

Coming down to last century, we find the lines from Tondern to Flensburg and from Husum to Eckernförde proposed by Danish engineers. The latter route was advocated by a distinguished Dutch engineer, named Stieljes, who in 1866 adopted the original plan of a dyke inspector, Petersen, adding important modifications. At length, in 1784, under King Christian, the Eider, which flows into the North Sea, was connected with the Bay of Kiel by a small canal starting from Rendsburg. Though only 11½ feet deep, and therefore unavailable for large vessels, it has been of no small advantage to coasting vessels, of which 4000 have passed through it yearly. The numerous locks and the windings of the river Eider are also a drawback to its usefulness. In the sixties various plans were set forth for canals opening into the North Sea and Baltic at different places, and among them was one in which Kiel was selected as the eastern terminus and Brunsbüttel as the

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[1] *Globus*, May 1895.

western. This was warmly advocated by the Hamburg shipowner Dahlström, and it is practically to his efforts that the present canal owes its existence. Prince Bismarck supported the project on strategical grounds, as affording a short route for the transference of the Prussian fleet from one sea to the other as circumstances might require, and it is this consideration which finally determined the selection of Kiel as the eastern terminus. Furthermore, it was considered important from a political point of view, that the canal should lie as far as possible to the south, within Holstein territory and not in the border province of Schleswig. Consequently the plan of Stieljes was passed over, which would have utilised the only roadstead on the German coast of the North Sea sheltered from north-westerly storms, the Pelworm Deep. Admiral Batsch regrets that this plan was not subjected to an examination by experts.

However, the route advocated by Dahlström, and surveyed at his instance by the engineer Boden, was adopted. It starts from Brunsbüttel on the Lower Elbe, crosses the moorland by the Kuden lake, and passing Grünthal, the highest ground on the route, reaches Rendsburg. Here the canal joins the old Eider canal, parts of which are incorporated in the new work, and running eastwards touches the lake of Andorf, then the Obereider lakes and the Flemhude lake, and finally enters the west side of the harbour of Kiel at Holtenau. On March 16th, 1866, the Bill for the construction of the canal was passed, and an Imperial Commission appointed, with its headquarters in Kiel.

It was rightly assumed that as a waterway for sea-going vessels the canal should be constructed throughout on the same level, so as to avoid the hindrance and difficulties connected with locks. Locks have, however, been found necessary at the outlets of the canal to guard against the disturbing influences of the ebb and tide in the North Sea, and the difference of the level of the water in the Baltic. The mean height of the water in the Baltic, which has no tide, is about five feet below high-water mark in the Lower Elbe, and even in a length of 60 miles this difference of level would cause easterly or westerly currents in the canal. The effect would be somewhat increased by the slight fall in the bed of the canal for about one-third of its course in its western section.

The length of the canal is 61¼ miles, its breadth 72 feet at the bottom increasing to 200 feet at the surface of the water, and its depth 29½ feet; it can therefore be navigated by the largest vessels. The locks at the eastern and western ends have each a length of 492 feet and a breadth of 82 feet. Accordingly they will not accommodate swift Atlantic steamers, which can therefore enter the canal only at times when the gates can be left open.

The mean water-level in the canal will be about the same as that of the Bay of Kiel. The latter is subject only on twenty-five days in the year to fluctuations of any importance, so that the eastern gates may stand almost always open. As far as Rendsburg the bottom of the canal remains at the same level, but from there to Brunsbüttel there is a slight fall, beginning with 1 : 200,000 and ending with 1 : 25,000.

For the convenience of men-of-war there are bays excavated at

intervals of about 7½ miles, 1480 feet long by 200 feet broad, where trading vessels will have to wait while the warships pass. The total amount of the excavated soil is calculated at 97½ million cubic yards, entailing a cost for labour of £3,550,000. The deepest cutting is near Grünthal, and has a maximum depth of 108 feet. The difficulties of the work naturally differed with the kind of soil. The country may be divided into three parallel zones—hilly land in the east, a more or less sandy but dry tract in the middle, and marsh and land flooded by the sea and the Elbe on the west. Here the greatest difficulties were encountered; in some places the canal had to be enclosed in dams, as the mean level of its water is above the adjacent ground. Two-thirds of the excavation was executed in dry ground, occasionally interrupted by lakes and moors, and one-third along the course of the old Eider canal, the sharp windings of the latter being, however, avoided. One of the hardest tasks was the sinking of the canal in the moors by the Kuden and Meckel lakes. On these places a bed of firm sand was laid, through which a channel was excavated when it had thoroughly settled, so that the bed of the canal runs between dams of sand. In the moorland of the west it has been possible to sink these dams right down to the firm ground below, which here lies nearly horizontal.

No less interesting are the measures by which the connection with the old Eider canal within the bounds of the burgh of Rendsburg and the passage of vessels from the new waterway into the Eider have been accomplished. Owing to the difference between flood and ebb-tide, which at Rendsburg amounts to about 3¼ feet, a sluice has been found necessary; it is 39 feet broad by 18 deep. As the new channel lies 23 feet below the Upper Eider, the fall of the water in the river has drained the wells of Rendsburg, and the Imperial Treasury has paid a compensation of £15,000 to the town.

The sinking of the Flemhude lake is another noteworthy incident. Originally this lake had an area of 578 acres, and its level, coinciding with that of the highest part of the Eider canal, was 23 feet above that of the Baltic and of the new canal; consequently, on the construction of the new canal its area was diminished by 207 acres, and a large extent of land was laid bare. But the surrounding property must have their water supply maintained. Accordingly a dam was thrown up around the lake, whereby a circumscribed canal 23 feet above the lake was formed, into which the tributaries now pour their water. This water is allowed to overflow into the Flemhude lake, and thence into the canal, by a waterfall at the southern end. The power thus generated will be used to produce electric light.

Of the four railways which intersect the route, two—the line through the Holstein marshes and the Neumünster and Rendsburg line—are carried over the canal by swinging bridges; a separate bridge to each track, lest one should get out of order. The other two are provided with permanent bridges. Besides these, sixteen ferries, the most important worked by steam, maintain communication between the severed districts. The most striking constructions of this great engineering work are the imposing bridges at Grünthal and Lewensau. In order that fully-rigged

warships may be able to pass under, the bridges must have a clear passage of 138 feet above the water, and therefore the deepest cuttings in the neighbourhood were chosen for their sites, the additional elevation requisite being obtained by embankments. These rise at the bridges to over 65 feet, and have a volume of 2,616,000 cubic yards. The Grünthal bridge has a span of 513½ feet, and the Lewensau of 536 feet. The Grünthal bridge could be erected before the excavation of the canal, whereas the other required supports reaching down to the bottom of the canal.[1]

The advantages to be derived from the new canal are, firstly, the shortening of the voyage to the Baltic. In a voyage from Kiel to Wilhelmshaven the distance saved is 238 nautical miles. If, again, according to an illustration of Admiral Batsch, the Skaw be taken as the vertex of an isosceles triangle the base of which is a line running from Swinemünde to a point somewhat north of Texel, the length of the base will be about 300 sea miles, and that of a side 250 miles, and though the course is somewhat longer owing to its windings, there remains a considerable distance saved by way of the canal. Herr Riedel reckons the time occupied in the passage of the canal at 13 hours, being at the rate of 4¾ miles per hour, and on the excellent map accompanying his article gives the time saved on a voyage from the harbours of the Baltic to Hamburg at 40 hours, and to London at 22 hours. For sailing vessels the gain will be much greater.

Of still more importance is the saving of life and property. The voyage round the Skaw is notoriously one of the most dangerous. At the present time 35,000 vessels on an average pass annually through the Sound. Between 1877 and 1881 the yearly average was 24,000, the total tonnage being 8,300,000 register. Out of these 92 German vessels of about 20,000 aggregate tonnage were totally lost, together with goods valued at between £150,000 and £200,000, besides 69 vessels which foundered at places which were not specified. Between 1858 and 1885 no fewer than 6316 vessels ran ashore on the Swedish and Danish coasts, 91 steamers and 2742 sailing vessels being lost. Every year some 200 vessels and 500 men of all nations perish on this route, and the loss in goods amounts to £500,000. The coast near Agger is significantly called the "Graveyard of Ships" or the "Iron Coast."

Lastly, Herr Riedel hopes that, as the canal will give the advantage to German vessels, both in time and expense, over the British, the trade in German vessels with the ports of the Baltic will receive a great impetus, and that these ports will increase in prosperity now that they have more direct access to the commerce of the world.

The cost to the Imperial Treasury of the construction of the canal has been £7,800,000, from which must be deducted £2,550,000 spent on defensive works, and £2,500,000 contributed by Prussia. The annual expenses of maintenance and management are estimated at £95,000. The dues are fixed at 9d. per ton, including towage and pilotage, and

[1] *Ueber den Bau des Nordostsee-Canales.* Von Josef Riedel. *Deutsche Rundschau.* Jahrg. xvii. Heft 8.

from these data Herr Riedel, assuming that 18,000 vessels, with an aggregate tonnage of 5,500,000, will use the canal annually, calculates that the £206,250 thus gained will pay, after deduction of the outlay, about 4 per cent. interest on the capital invested. Admiral Batsch, however, states, probably more correctly, that the total cost of construction is £8,435,050, and £7,800,000 the capital bearing interest, and hence calculates that 24,000 vessels, with a tonnage of 8,300,000 tons, would not yield enough to pay 3½ per cent. as well as the working expenses. And were the dues raised, the advantage gained in time would be nearly balanced by the expense incurred on the route through the canal, so that the State will probably be obliged to subsidise the canal. But, in view of the benefits conferred on navigation and on the commerce of the country in general, there is no reason to complain on that score.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings in May.

Mr. G. F. Scott Elliot, who has lately returned from Ruwenzori, delivered a lecture in Edinburgh on May 2nd. His address was entitled "The Mountains of the Moon and Tanganika." Major R. G. Wardlaw Ramsay presided.

The last meeting of the session was held in Edinburgh on May 16th, when Captain Cayley-Webster read a paper on "Travels in German New Guinea and adjacent Islands." Major-General Sir R. Murdoch Smith occupied the chair.

The Late Mr. John Gunn.

At a meeting of Council held on May 3rd, the following resolution was passed, on the motion of Mr. Richardson, seconded by General Sir R. Murdoch Smith :—

"The Council records the loss the Society has sustained by the death, on the 29th ult., of Mr. John Gunn, who has acted as Hon. Librarian since January 13th, 1888, and who has devoted much time and ability to the interests of the Society."

The "Challenger" Reports.

At the same meeting the following resolution, moved by Sir R. Murdoch Smith, was carried unanimously :—

"The publication of the Reports embodying the scientific results of the *Challenger* Expedition having been completed under the editorship of Dr. John Murray, one of the Vice-Presidents of this Society, the Council desire to congratulate him most cordially on the termination of his arduous and important labours, and resolve to record in their minutes their sense of the signal service he has rendered to science by the production of this national and monumental work.

"It is to the Council a matter of legitimate satisfaction that this great work has been given to the scientific world by one of their members.

"While recognising the extraordinary value and extent of the additions which these Reports make to zoology and cognate sciences, the Council wish to emphasise the importance of the contributions of Dr. Murray himself on physiography, and especially on oceanography, a subject on which he is justly regarded as one of the highest authorities."

The Franklin Commemoration.

The meeting to commemorate the departure of Sir John Franklin's last expedition fifty years ago from Stromness will be held at the Society's Rooms, Edinburgh, at 3 P.M. on 4th June. The chair will be taken by the Marquis of Lothian, President of the Society, and Admiral Sir Leopold M'Clintock, with other Arctic travellers, will be present. A large and interesting collection of objects will be exhibited. Some of these are relics of Franklin and his officers and men, as well as of the expeditions sent in search of them; while others illustrate life in the Arctic regions, whaling and sealing.

The Geographical Congress.

The Society has been asked by the Secretary of the Exhibition Committee to lend or procure, for exhibition, some geographical curiosities—old maps and atlases or MSS. (*portulani*, for instance). Members who possess any such old works are requested to communicate with the Secretary of the Society.

GEOGRAPHICAL NOTES.

By The Acting Editor.

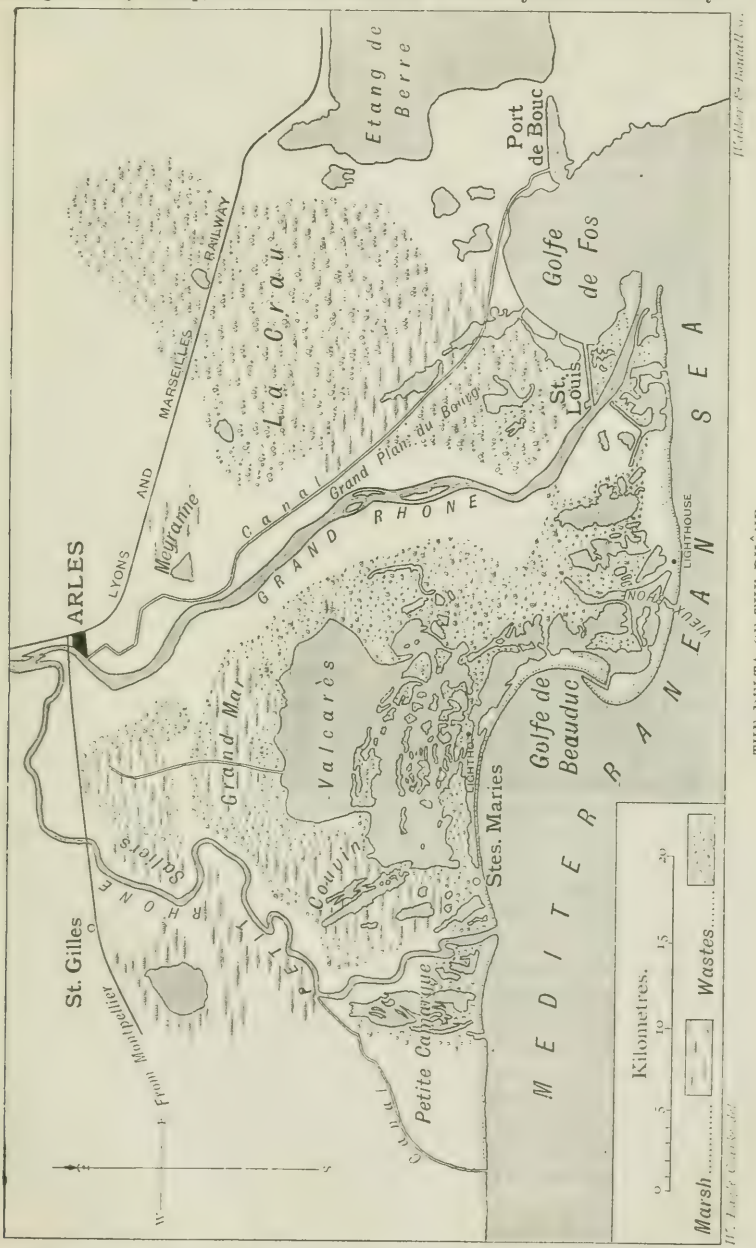
EUROPE.

The Climate of Edinburgh in 1894.—Mr. R. C. Mossman, in a paper contributed to the *Proceedings* of the Royal Physical Society, gives his meteorological observations during last year. Among the "noteworthy phenomena" he mentions the maximum pressure, 30·759 inches, on January 3rd; and the lowest, 28·121 inches, on December 22nd, during a severe storm. The highest shade temperature was 77·5° on July 6th, and the lowest 13·9° on January 6th. The highest temperature in the sun, 130·4°, was also registered on July 6th. The greatest range of temperature, 31·4°, occurred on March 29, and the least, 2·7°, on July 25th.

Several exceptional records were made in 1894. The rainfall in February was 6·81 inches, or 1·6 inches more than that of the wettest February known, that of 1848, though observations have been made in different parts of Edinburgh for the last 130 years. A very sudden rise of temperature of 10·5° occurred on the 11th in the space of seven minutes; it was due to the wind shifting from east-south-east to south-west. The mean temperature of March, 44·1°, was the highest since 1882, and the sunshine recorded, 171 hours, was the greatest since the records was commenced in 1878. May was unusually cold, the mean temperature being 47·1°, or half a degree less than that of April, a circumstance that has occurred only nine times since 1764. September was remarkable for a rainfall of under half an inch, the smallest for the month since 1860. November was singularly mild, with a mean temperature of 5° above the average. Only two milder Novembers have occurred since 1764, viz., those of 1818 and 1881. The rainfall was only half the average. December was noteworthy for two exceptionally severe storms. At the end of Mr. Mossman's article are tables of the various records. The mean pressure and temperature for the year were rather above the average, and the annual rainfall was 32·2 inches, or 2·31 inches above the mean for 1868-93. The sunshine recorded was 1201·2 hours, or 27 per cent. of the possible duration.

The Delta of the Rhône.—In May 1894 Mr. W. Eagle Clarke, of Edinburgh, made an ornithological excursion in the delta of the Rhône, called also the Camargue, and known among ornithologists as the haunt of some rare and local marsh birds,

including the flamingo, ibis, the purple gallinule, and Savi's and the aquatic warblers. Mr. Clarke published an account of his excursion in *The Ibis* for April, accompanied by a map, the block of which he has kindly lent to the Society.



THE DELTA OF THE RHÔNE.

The physical features of the delta are described in general in the following extract :—"The 'Ile de la Camargue' is a vast plain covering an area of nearly

400 square miles. It lies between the two branches of the Rhône and is triangular in form, having the quaint town of Arles at its apex, and the Mediterranean as its base. It is remarkable for the extent of its marshes clothed with forests of reeds; the number of its shallow 'étangs' and lagoons; its wide wastes covered with low, salt-loving shrubs; and, in summer, its expanses of sand glittering under a saline efflorescence. The greater part of the region is indeed simply desert; and the similitude is heightened by the ever-present mirage, which shimmers over plain and lagoon, much to the bewilderment of the visitor unacquainted with the geography of the region. It must not, however, be inferred that cultivated areas are entirely absent, for this is not the case. In the north and also in the east and west, along the banks of the Rhônes, the labours of the reclaimer and his elaborate system of irrigation have prevailed. But in the central and southern districts, which form at least two-thirds of the area of the delta, the ground is so strongly impregnated with salt that its redemption is considered to be hopeless.

"The Camargue boasts of one village only, the small fishing community of Saintes Maries in the extreme south-west. In the cultivated districts there are scattered farmsteads; but in the south it is practically uninhabited, there being only two lighthouses, the few lonely 'vigies' of the Garde Maritime and Postes des Douanes, and the Saline de Giraud. Saintes Maries, described in Murray's *Guide* as having 'all the appearance of an African town in the desert, and consisting of an old edifice, half fortress, half cathedral, with a few wretched dwellings grouped about it, and as desolate as a necropolis,' formed our headquarters."

On the cultivated districts alluded to above, vines, rye, and oats flourish; on land newly reclaimed rice is grown as a first crop to purify it. The birds of this section of the Camargue are simply the ordinary species common to such haunts in South-western Europe. There is no woodland worthy of the name, but only a few narrow belts of pine trees, and therefore the titmouse, wood-pecker, etc., are seldom met with.

The great marshes of the Camargue lie chiefly in the north, centre, and west, and probably cover an area of not less than 50 square miles. They are remarkable for their shallowness and the dense growth of reeds which clothes the entire surface of most of them. Thus reed-loving birds alone abound, and there is an absence of terns, gulls, and ducks, which frequent sheets of open water.

One of the most singular physical peculiarities of the Camargue is the extraordinary number of lagoons which cover fully one-third of the total area, extending in a broad belt along the Mediterranean. "The largest of these lagoons is the Étang du Valcarès, the area of which varies, according to 'authorities,' from 10 to 30 square miles; but a careful computation, based upon the official map, places it at the happy medium, or about 20 square miles. One of the many peculiarities of these lagoons is their extreme and uniform shallowness. Thus Valcarès is probably nowhere, and at no season, more than 18 inches deep; and at the date of our visit it was not more than six inches, and only one-half its normal area, owing to the extreme dryness of the season. So great, indeed, had been the drought that the lagoons shown on the map as lying immediately to the south of Valcarès, and between that étang and the Mediterranean, were, in May 1894, sandy [1] deserts, without a blade of vegetation, but sparkling under a white efflorescence of salt, which in a few places was no less than two inches in thickness and pure white in colour. The dreariness of this area of dried-up lagoons was extreme, and scarcely relieved by oases—in wet seasons low flat islets—in the shape of patches of waste with

[1] The sand is blown from the shores of the Mediterranean and forms a thin carpet over a floor of particularly tenacious alluvium.

scanty heath-like vegetation. The waters of Valcarès are intensely salt and marvellously clear, and entirely devoid of vegetable life, unless of a microscopic nature. Its animal-life, so far as variety is concerned, is most limited and appeared to be confined to a few eels, and myriads of that tiny crustacean the brine-shrimp (*Artemia salina*). The floor of all the lagoons and étangs in the Camargue is wonderfully tough, and possessed of great water-holding qualities; and thus the waters are drawn off almost entirely by evaporation, which is exceedingly rapid under the fierce sunshine of spring and summer. We had evidence of this remarkable water-holding quality of the soil, when after a few hours' heavy rain several étangs were restored to a few days' existence. The Mediterranean, under the influence of strong southerly winds, is driven some miles inland, and also restores for a time some of the contiguous lagoons. In the south-east, in the Beauduc district and vicinity of the Vieux Rhône, many of the étangs adjoining the Mediterranean communicate with the sea: and these are never quite dry, though they vary considerably in the extent of their waters. They, too, are extremely shallow, and are studded with islands." The only bird which makes its summer home amid this singular waste of waters is the flamingo, and it is practically confined to the Étang du Valcarès. In the season, however, a multitude of wading birds visit the lagoons and shores, for the Rhône valley is a highway much used by these and many other feathered travellers on their way to or from the Arctic and Tropical regions.

The great wastes share with the lagoons the entire southern portion of the Camargue, and are also extensive in the north. In appearance they much resemble heaths, being clothed with the salt-loving sea-blite (*Suæda fruticosa*, var. *brevifolia*). Bird-life is naturally scanty here. Several species seem to be confined to the immediate vicinity of the Grand and Petit Rhônes, the most interesting of these being the Egyptian vulture. The lagoons and wastes are much affected by mirage.

Lastly, Mr. Eagle Clarke speaks of La Crau, a singular, stony plain, 30,000 acres in extent, lying to the east-south-east of Arles. It is supposed to owe "its existence to the Rhône and the Durance, by whose waters its innumerable stones were deposited. The stones covering this vast area are certainly rounded by the action of water, and they vary in size from the dimensions of a man's head to that of his fist. They are loose, not imbedded, and form a stratum of great thickness. Between the stones there struggle for existence a few thin blades of parched-looking grass. The Crau is a dreary place in the extreme, and most toilsome to traverse. On the 18th of May we covered many miles of its rugged surface, which for roughness can only be compared to the dry bed of a mountain torrent. In the west of the wilderness there is some cultivation. This has been brought about by resort to rather remarkable methods—namely, the bringing of all manner of rubbish from Marseilles, which, after having been weeded of old boots and various tins, etc., is ground up in a mill and then spread over the surface of the stones. By this means, and an elaborate system of irrigation based upon the waters of the Durance, a marked change has been wrought, for good grass and vines now flourish, in strong contrast with their immediate sterile surroundings. The birds haunting this dismal plain are neither numerous in species nor in individuals." A list of all the birds observed concludes the article, with notes on their favourite haunts, etc.

New Lake in Italy.—Not far from Castelnuovo di Porto, on a plateau to the right of the Tiber, stands the village of Leprignano with about a thousand inhabitants, at a height of about 600 feet above sea-level. On April 8th, a rumbling sound was heard in this place, which was repeated on the 12th and 13th. On the latter date

the ground over an area of about 15 acres collapsed, and the hollow thus formed was filled with water. Sulphurous gases bubbled up through the water of the new lake, and puffed out of cracks along its margin. The ground around is very unstable and probably the lake will extend its boundaries. Professors Meli and Keller have left Rome to investigate the origin of this new phenomenon.

ASIA.

The Interior of Arabia.—*Globus*, Bd. lxvii. Nos. 11-14, contains an account of a journey in Arabia made in 1893 by the late Baron Eduard Nolde. He set out from Damascus on New Year's day with a large caravan and an escort of Turkish soldiers, and, passing Bosra, the ruined fortress of Salkhad, and the ruins of the Roman fort of Ezrak, came to Kaf, an insignificant place of 200 to 300 inhabitants, who earn a meagre living by cultivating a few dates and collecting the salt which forms a crust on the neighbouring steppe. On the next day Baron Nolde continued his journey to Issery and Jof across immense deserts for the most part stony, but sometimes of a steppe-like character. On arrival at Jof, Baron Nolde had some little trouble with Johar, the Governor. The man who, with two soldiers, had been sent in advance to announce his coming was disarmed and retained as hostage, and the gate of the fort was closed. However, after a short parley, in which the traveller explained that he wished merely to explore the country, and that the presence of the Turkish soldiers constituted no menace to the Governor's authority, he was admitted alone into the castle. As soon as he had lifted the cup of coffee that was handed to him to his lips, the Arabs reciprocated the confidence he had shown by admitting fifty of his armed followers, and after that the most cordial relations subsisted between Baron Nolde and the Governor. Jof is a large town for Arabia, containing 10,000 to 12,000 inhabitants. The water is good and abundant, the gardens beautiful and extensive, and the dates have the reputation of being the finest in the world. Sheep, calves, and fowls could be bought in any number, and also corn for the horses and camels, and Johar provided two excellent guides to conduct the caravan across the Nefud desert.

There are two routes across the desert to Haïl. The more frequented, which was followed by Palgrave and the Blunts, passes through the oasis of Jebbah, while the other, leaving Jebbah on the right, passes the fort of Haiyannieh. Baron Nolde chose the latter as being less known, and therefore more interesting. These routes diverge from Gara, a village 22 miles to the south-east of Jof. Fifteen miles to the south of Gara is Hoa, where are two wells, the last water on the route. The water is small in quantity and very bad, but near at hand is a place where the rain forms a small pool that is scarcely ever dry. It lies within the limits of the desert and the land around is the reddest part of this desert—so red that, especially in the light of the setting sun, it looks as though it were covered with blood. The water, though not bad tasting, was as red as crayfish soup, and the skins were dyed red for weeks after this water had all been drunk.

Between Hoa and Haiyannieh the elevation, as indicated by the barometer, varied from 2600 to 3300 feet above sea-level. The cold was greater than could be accounted for by such an elevation in this latitude (30° to 27° 30′), and was no doubt due to the bad conductivity of the sand and the effect of radiation. The days were sometimes warm and pleasant, but at night the thermometer sank to 9° or 18° below freezing-point. The changes of temperature were remarkably great and sudden; on Feb. 1st the thermometer marked 42° F. at noon and 45½° at 2 o'clock; then it rose rapidly up to 78° at 7 o'clock, and fell still more suddenly—indeed, within 15 minutes after sunset—to 17½°, reaching a minimum of 12°

towards morning. Wind is of constant occurrence, and on February 2nd a heavy snowstorm covered the desert with a layer several inches deep. Such falls of snow are not unknown here, but are so rare that the last occurred 50 years before.

On February 4th the party came in sight of the fort of Haiyannieh. This is practically the end of the desert, so far as difficulty of travelling is concerned ; for though the Nefud extends three days' march further to the south, travellers who have made six or seven days' march through waterless country think nothing of the shorter distance. From Hoa to Haiyannieh, the distance is about 180 miles. The Nefud is a desert of heavy red sand with undulations. On an average the crests of the undulations rise about 100 to 160 feet above their bases, though in some cases the relative elevation is as much as 230 or even 330 feet. On Baron Nolde the sand waves of the Nefud did not make the impression of marked regularity ascribed to them by some other travellers. The lines of elevation do not follow exclusively one sole direction, and they are, besides, occasionally connected by transverse undulations. The landscape is also relieved by numerous clumps of bushes, thorny and dry, with stems six to twelve inches thick. The fauna is naturally not abundant, and it is inconceivable how the animals that do live here exist at all. Hyænas, antelopes, gazelles, a few hares and a pretty grey fox were seen. Baron Nolde was assured, and at length was forced to believe, that the sheep and goats will not drink, even when water is put before them. No doubt they have, in the course of generations, acquired the faculty of satisfying their thirst with the homœopathic quantities of moisture contained in thistles and grass. Hyænas are never found at very great distances from water, but foxes live in the most remote parts of the desert ; perhaps the blood of the lizards and spring-mice suffices for their wants. The camels of Nejd can travel without water for 25 days in the cool season, and 24 in the height of summer, and an Arab horse is expected to go without water for 48 hours. These camels are remarkably swift, and though a horse can soon overtake them, he cannot cover a long distance in as short a time. The Turks have tried to utilise them in the more northern parts of Arabia, and for the post in Syria and Mesopotamia, but they soon deteriorate when removed to the north of the Nefud.

The fort of Haiyannieh is a rude, quadrilateral construction, of stone below and sun-dried clay above. It is much smaller than that of Jof, and is entered by one small iron gate. About 200 yards from it stands an isolated tower, which is connected by an underground passage with the fort, and helps to protect the wells which lie between. The wells are partly cut through the living rock and partly built round with solid hewn stone, and are probably the work of Assyrian kings. The water in them is abundant, and stands at a level of 460 to 560 feet below the surface of the ground. At the time of Baron Nolde's visit there were thousands of camels at Haiyannieh belonging to the Roalas, who use the Nefud as a winter pasturage, which they can do only if allowed to water their herds at the wells. Consequently, Ibn Rashid, the Emir of Haïl, is not only master of the Nefud, but has great power over a large part of the Anazehs, who recognise neither the authority of Turkey nor that of the Emir of Nejd.

At the time of Baron Nolde's visit Ibn Rashid was absent on a military expedition, and Haïl was governed by a regency under the presidency of Ibd Rashid's cousin, Hmud. Baron Nolde's emissary, Nasrullah, an Arab of Mosul, had great difficulty in persuading Hmud to allow his master to enter Haïl, a public reception and European costume being specially objected to ; and when the traveller did enter, and was installed in Ibn Rashid's old palace—a conglomeration of 250 to 300 rooms, closets, corridors, and galleries—his relations with the authorities were for some time very strained. It was with no very comfortable feeling that he received from Hmud a photograph of the French traveller Hubert, who was

murdered in 1885 between Haïl and Medina, especially as a scratch has been made across the throat of the portrait with some sharp instrument; the mark proved, indeed, on examination with a magnifying glass, to have been made some considerable time before. However, when things began to look very serious, events took place which quite altered the situation. Rain fell abundantly for 36 hours, Hmud's cough left him, and news arrived of the Emir's victories over the united tribes of the Oteibehs and Mteyr, and all these benefits were ascribed to the presence of Baron Nolde in Haïl. Henceforth he was cordially treated by all, and could even smoke in the streets, a practice held among the Wahabis as objectionable as wine-drinking, while the priests invited him to visit the mosques.

Haïl is not a large place, and does not contain more than 10,000 or 12,000 inhabitants. Ibn Rashid spends most of his time on the desert, and usually resides in Haïl only during the three or four hottest months of the year, when the desert is so burnt up that the camels cannot find even thistles to eat. Haïl is therefore a depository for women, children, treasures, and supplies rather than a capital. All the buildings, gardens, and wells are kept in excellent order, and are as clean and neat as though just completed. The town is encircled by a wall of mud, which serves rather for police purposes, and to check the first rush of a band of robbers when few soldiers are in town, rather than as a reliable defence. The palace is a large and gloomy but imposing edifice. The walls, 80 feet high, have no external openings but loopholes. The kitchens are kept in very good order, and are on a grand scale, for when the Emir is in Haïl more than 2000 men dine at his table, and the daily expenses of the kitchen amount to £100 sterling. The Emir's treasure, consisting of Turkish and English gold coins, is said to amount to from one and a half to two millions sterling. Whether this be true or not, there is no doubt that Ibn Rashid is a very wealthy man. One of the most important items of expenditure is the keeping up of the wells, and the construction of new ones; for in the absence of running water these are the only source of supply, during the long period of drought, for men and animals and for irrigation. The water is drawn up from great depths by wheels turned by camels, and conducted through small conduits to the fields. Barley is the principal crop, and in good years fetches a very high price. There are four schools in Haïl, and Ibn Rashid has spent large sums on education. The Koran and Arabic are the chief subjects of instruction, to which are added some geography and arithmetic. Slavery exists throughout the interior of Arabia, but the slaves are treated rather as spoilt children than as mere goods and chattels.

By four long marches Baron Nolde reached Oneyzeh, the most populous town of Arabia, with about 35,000 inhabitants. It has two walls at a distance of a mile and a half to two miles apart, the intervening space being occupied by gardens and plantations. After three more days' march, passing near Shakra on the left hand and traversing the little Nefud Bereida, the traveller encamped at a distance of five hours' journey from the place of rendezvous appointed by Ibn Rashid. The next day he set out early, and an hour's journey from the Emir's camp was met by three hundred riders, among whom were Ibn Rashid's nephew and presumptive heir, Abdul Azig Ibn Mataab, Hmud's eldest son and his seven brothers, and other notables of the principality. The Arabs are in great dread of foreign invasion, and hence as a rule do not like strangers to visit their country, and endeavour to represent their land as poorer and more worthless than it is; but on this occasion there was a grand display of horses and harness, and the riders were gorgeous in gold brocade and embroidery, satin and silk. Ibn Rashid, the King of the Desert, as he is called in Constantinople and Bagdad, received the traveller before his tent in a square formed by 2000 men. He is now 53 years old, rather under middle height, and powerfully built. His features are finely cut and his countenance

impressive; his eyes are sharp and piercing; his beard is closely trimmed and pointed like a Spaniard's. Baron Nolde stayed ten days in the camp, and had many conversations with the Emir, who sent for him or came to visit him every morning as soon as he was up. Ibn Rashid criticised severely the Turkish administration, and spoke with biting sarcasm both of the Sunnite and Shiite priesthood and of the ridiculous reverence, as he termed it, paid to saints and absurd legends. He was especially irate with the people of Mekka and Medina who, he said, corrupted the purity of religion and made a trade of it, whence resulted all kinds of evil—immorality, poisoning, and murder in every form. The Emir receives a number of Arabic and Turkish journals from Egypt, Syria, and Constantinople, and conducts a voluminous correspondence. On Baron Nolde's departure the Emir loaded him with presents, among them his own riding horse, and gave him repeated instructions regarding his journey to Meshed Ali and how to act in case of an attack by robber bands.

On March 5th the traveller left the camp to begin his march of nineteen days to Meshed, 520 miles distant. The route lies through almost continuous desert; some names appear on the maps, but there is really not a single inhabited place on the way. After seven days the caravan came to the Zobeida road, along which Harun al Rashid's favourite wife caused a number of cisterns to be constructed between Mekka and Bagdad, but most of these have been destroyed by the Wahabis to protect their country. Some difficulty was therefore experienced in procuring supplies of water, but at length, on March 22, the golden cupola of Meshed Ali appeared in the distance. The lake of Nejef, which is still marked on maps, has long ceased to exist. It was produced by an attempt of the Euphrates to force its way into a new bed. Hillah was sometimes without water, and the desert to the south of Meshed Ali would soon have been extensively flooded, had not the Hindiyah Canal been constructed. This important work, executed in 1891 by French engineers at a cost of some £200,000, saved a large part of Irak from desolation; the Euphrates is confined in its old bed, a certain quantity of surplus water being allowed to flow through the new canal.

Meshed Ali contains 22,000 permanent inhabitants, and at times its population is raised to 100,000 by the presence of Persian pilgrims. Its huge walls, in the form of an exact square, are so high that even from a distance only the golden dome which covers the grave of Ali is visible above them. Every Musulman of the Shiite sect who dies in Meshed or Kerbela (Meshed Hussein), or is only buried there, is according to tradition certain of entering heaven; and therefore the colony of rich Persians awaiting their decease in Meshed, or attending to the graves of their relations, is very large, and, through the money they bring into the city, they are all powerful. Formerly many thousand corpses were brought here for burial, but lately the importation has been forbidden lest cholera should break out in the city. A few are still smuggled in at enormous expense.

Lob-nor.—In *Petermanns Mitt.*, Bd. xli. No. 1, Major-General von Krahmer gives a full account of the journey of M. Koslof to Kizil Synur and Lob-nor alluded to in vol. x. p. 542. After passing the Chol-tau the traveller came to the hollow Shor-tuse at an elevation of 2100 to 2200 feet above sea-level, and camped by the well of Arpyshme. Salt swamps lie to the north and south, hemmed in by ridges of hills following the usual direction, west-north-west to east-south-east. On December 16th M. Koslof entered Kizil Synur, 122 miles from Turfan. The weather in the first half of the month was partly clear and partly cloudy. The thermometer at sunrise marked 19½° to 0° F., at one o'clock in the day between 39° and 25°, and at nine o'clock at night between 19½° and 8°.

From Kizil Synur, Koslof made an excursion in the country lying to the south-east, crossing the main branch of the Kuruk-tau. This ridge is cut through by a stream rushing through a gorge 65 to 130 feet broad, which in summer is quite filled with water. On emerging from the gorge, the traveller came to a broad valley running nearly west. To the east a summit named Yumulak-tau was visible. Then a country 2900 feet high was crossed, with springs rising in dry watercourses which descend from the Kuruk-tau. Beside them is desert and salt swamps. Crossing some ridges running east and west, composed of marble, slates, etc., M. Koslof reached the old bed of the Konche-daria, and turning southwards came across it again after a march of six miles. Then he took a north-westerly direction and returned to Kizil Synur, where he remained three days. On leaving this oasis on December 28th, he marched towards the south-west over a number of mountain spurs and transverse valleys, crossed again the old bed of the Konche-daria, and came to the town of Dural, situated on the right bank of the Konche-daria itself. Begun by the Chinese in 1891, this town is nearly completed ; it consists of a Chinese quarter surrounded by a mud wall, and a Mohammedan quarter, the latter forming a bazaar where Russian wares are offered for sale. Around the town are cultivated fields artificially irrigated. The river here is 65 yards broad and 16 to 20 feet deep. Willows, tamarisks, and reeds clothe its banks. Some 30 miles farther M. Koslof found the place where ten years ago the Konche-daria sent off a branch. The stream, at first narrow, gradually widens, and after six miles reaches the saline hollow Chivelik, which it fills, and then, under the name of Ilsh, enters a bed corresponding to its former size. Lower down the river again divides, forming two equal branches, one of which reunites after a course of five miles with the Konche-daria, which soon reaches the Tarim at Airyglan, while the other forms the lake of Sogot, and falls into the Tarim twelve miles farther down. Of these two lakes, the Chivelik-kul and the Sogot, the former has a length of 9 miles and a breadth of 6, with a depth of $6\frac{1}{2}$ to 20 feet. Its water is transparent and sweet. The Sogot, lying to the south-east of the Chivelik, is 6 miles long, $1\frac{1}{4}$ broad, and $6\frac{1}{2}$ to 20 feet deep. Its banks, clothed with tamarisk and reeds, are peopled throughout the year. The Tarim was not entirely covered with ice. A plain covered with vegetation extends to a varying depth from the bank. Near the mouth of the Tarim in the lake of Kara-buran, 56 miles from Airyglan, the expedition crossed the river and turned eastwards, reaching 6 miles farther the desert which stretches far towards the north-north-east. Kara-buran lay 27 miles to the south.

Calm and clear weather prevailed on the 2nd and 3rd of December. Snow fell twice, but was quickly thawed. In the morning the thermometer sank when the sky was clear to $-11°$ F., rising to 27° at one o'clock. At present there are two villages, Bash-Abdal and Abdal, situated at the south-western end of Lob-nor, but formerly there were more. Of the six mentioned by Przhevalski, only one, Kum-chapkan, containing eight families, is still in existence ; the others are broken up, the inhabitants having migrated to the Lower Tarim or the village of Charkhalyk, and the people of Kum-chapkan have their fields and gardens at Charkhalyk. The natives of Lob-nor possess large flocks and herds and even camels.

The Lob-nor has not changed its character. Below Abdal the Tarim divides into three arms, which form a number of larger and small lakes buried in tall reeds. The central and longest arm runs for a distance of 53 miles. Salt marshes surround the Lob-nor, which can be travelled round in twelve days. For 43 miles M. Koslof skirted the Lob-nor, and then crossed an uneven saline morass to a series of hills lying to the north of the Altyn-tagh. Marshy ground, with pools of bitter water, reeds, tamarisk, and conifers were passed ; but as the travellers came

nearer to Sa-chau the vegetation grew more luxuriant, and the horses and camels found abundant fodder. Water is plentiful in springs and small lakes. The lake Khala-chi, 19 miles in circumference, lies 25 miles to the north-west of Sa-chau. After crossing the river Dankhe, M. Koslof entered the town on February 9th.

AFRICA.

Egypt.—Lord Cromer's *Report on the Finances, Administration*, etc., of Egypt gives a favourable account of the condition and progress of the country. The excess of revenue over expenditure was larger than the estimate, and amounted to £E. 785,000 (an Egyptian pound = £1, 0*s.* 6*d.*); but the available surplus, owing to international agreements, was only £E. 155,000. But land-tax to the amount of £E. 245,000 was temporarily remitted, and Lord Cromer considers that about £300,000 annually might be sacrificed to decrease taxation or for some other purpose. Besides this sum the economies from the partial conversion of the debt now amount to £E. 1,455,000, and are being increased by about £E. 408,000 yearly; but this money, owing to international agreements, cannot be touched.

This satisfactory financial condition has been attained in spite of the commercial depression. It may be calculated that Egypt has lost nearly three millions a year through the fall of prices from 1881 to 1893, and probably the country suffered yet more severely from the same cause in 1894. The causes which have in great measure compensated for the fall in prices are improvements in the system of irrigation, which have increased the amount and value of the crops, and reforms in the fiscal system, which have improved the position of landowners and cultivators. Nevertheless, in view of the present agricultural depression and the possible continued fall of prices, coupled with the embarrassments due to international engagements, strict economy is still necessary, and the execution of some public works and of many administrative reforms may have to be postponed. Among the latter is the reform of the land-tax, which, though probably not an unduly heavy burden on the country, is very unequal in its incidence as at present assessed. In this connection it may be mentioned that, in consequence of a statement that the Egyptians were steadily progressing down the path of poverty and depression, an inquiry has been made into the amount of indebtedness of the landowners. It has been found that the figures given by the registers of mortgages are misleading; that the total indebtedness, instead of being over £E. 20,000,000, is little more than a third of that sum; that seventy-one per cent. of the whole debt is borne by large proprietors owning more than fifty *feddans* (about fifty-two acres) each, nearly a seventh part of their holdings being thus burdened, while, on the other hand, the small proprietors, with holdings not exceeding five *feddans*, who constitute about five-sixths of the total number, can only be credited with a little over seven per cent. of the debt, while barely two and a half per cent. of their lands are mortgaged at all. Moreover, the money borrowed on mortgage appears to be almost invariably invested in the purchase of new lands.

The estimated value of the exports in 1894 was £E. 11,884,000 and of the imports £E. 9,266,000. These figures show a falling off since the preceding year of £E. 906,000 on exports, and £E. 548,000 on imports. The decrease in exports is accounted for by the fall in prices of cotton, cotton-seed, and sugar. The exports of maize and wheat were considerably larger, but the prices had fallen thirty per cent. One of the most important items in Egyptian commerce now is the export trade in onions. About fifty-five per cent. of the products were sent to Great Britain. Cotton was exported to America in increased quantities.

Progress has been made by the Public Works Department in various directions. In consequence of reductions in the fares the passenger traffic has more than

doubled itself since 1890, and the gross receipts have increased by thirty-five per cent. The telegraph service pays its expenditure, but does not yield any net revenue. There has been an increase in the number of steamers entering the port of Alexandria, notably British steamers, and a new direct pass into the port, with a depth of twenty-eight feet at low water, has been opened, through which ships can enter at night and in all weathers. Various improvements in the irrigation works have been effected in the past year, and the exceptionally high flood entailed a much smaller expenditure than in former cases, and passed off without causing any damage. While equal in duration to any of the other four great floods of the last twenty years, that of 1894 was more dangerous because it reached its maximum and began to fall only just before the date when the basins must be opened to allow of the winter crop being sown in time to ripen before the summer heat comes on.

The Nile reservoir project is unfortunately one of the works which must for financial reasons be postponed. A dam and reservoir on the First Cataract at Aswân have been agreed on by the Technical Commission, as already reported in the *Magazine*, the height of the dam being chosen so that only some of the less important temples on the island of Philæ would be submerged. It has also been agreed by the Egyptian government that a scientific and archæological investigation of the whole of Nubia should be paid for out of the funds devoted to the execution of the works. When the first reservoir has been completed and its benefits felt by the people, the construction of a second to the south will no doubt soon follow.

AMERICA.

Melville Bay.—An account is published in the *Geogr. Journ.* for April of Astrup's journey to Melville Bay, alluded to on p. 32. He arrived at Cape York on April 11th, and left it on the 15th. Before reaching Bushman Island, 12 nautical miles from Cape York, he sighted to the north two hitherto unknown islands of considerable size, and in the afternoon perceived in the distance numerous glaciers of gigantic dimensions. Indeed, the whole coast-line of Melville Bay is continually broken by large glaciers. On the third day the party came to an island, rising in the centre to a cone 300 to 400 feet high, which was an excellent point for observations. This proved to be Thom Island, and an observation gave its latitude as 75° 41′ 44″, nearly the same as that marked on the map, viz., 75° 40′. Of the 130 miles of coast, between Cape Melville in the north-west and Red Head in the south-east, which could be seen from the island, fully 90 miles are occupied by large and small glaciers. If to these be added the glaciers between Cape York and Cape Melville, and the colossal ice-stream indistinctly seen to the south of Red Head, which probably extends almost unbroken to the neighbourhood of the Devil's Thumb, we get a total mass of moving ice nearly 150 miles in width. As regards the geology of the land, which crops out here and there as imposing capes or as lonely nunataks at a distance from the coast, there is little new to say. The trap formation, with its gloomy colour contrasting with the white snow, is of frequent occurrence, while the coast in general is, as usual, of archæan structure. The steep bluffs on the coast have a height of 2000 feet, while the land in the background rises to greater elevations; thus the dome of Cape Walker is certainly over 3000 feet in height; and another lofty dome, some 15 miles inland, to which Herr Astrup gave the name of Mount Haffner, seemed to be not less than 5000 feet. After leaving Thom Island the party made directly for the position of Cape Murdoch, where they found nothing but a lonely nunatak placed in the midst of an imposing glacier. Thence the party returned to Cape York, and on their way

back to Inglefield Gulf noticed on Saunders Island some stone huts, which had been deserted by the natives owing to the encroachment of the sea. Similar indications of a sinking coast-line were noticed somewhat farther south by Dr. Kane, who supposed the axis of the oscillation to which, it is believed, the whole of Greenland is subject, to lie somewhere to the south of the 77th parallel. The natives, however, many of them old men, spoke of a sinking of the coast both along the south side of Whale Sound and on Northumberland Island (77° 15′), and therefore the axis of this movement may be situated somewhat farther north than hitherto supposed.

MISCELLANEOUS.

M. Feillet, Governor of **New Caledonia**, has recently visited the **coal** deposits of the Dumbea. Coal exists in all the mountains which overlook the plain watered by this river; and the engineer, M. Caubry, states that the quality is excellent.

The second **Italian Geographical Congress** will be held in Rome in the later days of September. The Congress will be divided into four sections, as follows:—(1) Scientific section (Mathematical Geography, Cartography, Physical Geography); (2) Commercial and Economic; (3) Educational; (4) Historical (History of Geography and Cartography, Historical Geography).

Dr. Robert Stein, whose plan for a systematic exploration of the Arctic regions had to be abandoned from want of funds, is to be the leader of an **Arctic Expedition** organised by the U.S. Geological Survey. The expenses will be borne by American capitalists, who have contributed 500,000 dollars for the purpose. The object of the expedition is to explore the archipelago lying off the north coast of America. Mr. Tyrrell, of the Canadian Geological Survey, has been invited to take the command of a detachment and search for Björling and Kallstenius.—*Deutsche Rundschau*, Jahrg. xvii. Heft 8.

Dr. J. G. F. Riedel takes exception to the statement of Professor K. Martin that the natives of **Buru and Ceram** are of unmistakable Papuan type (see p. 193). This type is only found, he says, among the Papuan slaves, introduced by slave-traders and their descendants. Professor Virchow has rightly said that the natives of Ceram belong to the Malaysian stock, but are different from the Malays proper. The inhabitants of Buru are of the light-brown Malaysian race. Dr. Riedel has never seen the Papuan type either among the inhabitants of the coast or among those dwelling in the mountains and the interior.

The **Railway from Massaua to Kassala**, as projected by the Italian engineers, will run from Saati to Ghinda by the valley of the Yangus and Baresa; from Ghinda to Keren through Kasen, Az-Teklesan, and Ali-Beret; from Keren to Kassala, through Agordat and Sabderat. It will pass through all the different zones of altitude and, consequently, of climate and vegetation in Eritrea, from sea-level to Kasen (maximum altitude 8200 feet), and the section from Baresa to the Shotel will traverse a country adapted for colonisation by Italians. The length of the line will be about 300 miles.—*Bol. della Soc. Geogr. Italiana*, vol. viii. Fasc. 4.

A hundred years ago, on April 1st, the celebrated **Atlas of Mercator** was published at Duisburg. It was not the first work of the kind, for the *Theatrum* of Ortelius appeared in 1570. According to Gautier Ghymmius, burgomaster of Duisburg, it appears, however, that Mercator had, before that date, intended to form a collection of maps in one volume, but deferred the publication in order to give his friend Ortelius an opportunity of restoring his fortune by the sale of the

Theatrum. Mercator's Atlas was issued in three parts, the last of which was on the point of completion when the illustrious cartographer died on December 2nd, 1594, at the age of eighty-two. His son, Rumold, finished the work, and dedicated some of the maps to Queen Elizabeth.—*Le Mouvement Géogr.*, No. 9.

In *Natural Science* for May, Mr. W. J. Lewis Abbot gives a few notes on **a cave in Oban Bay**, lately discovered by Mr. M'Arthur. The Society of Antiquaries of Scotland supplied the funds necessary for a thorough investigation, but the severe winter interfered somewhat with the work. Much interesting information has, however, been obtained. A large number of bone and flint implements, animal bones, and human bones have been found. The cephalic index of a skull found in the upper layer of deposits is 75, while that of a skull in the lower layer is considerably less. During the occupation of the cave the land sank, and the troglodytes tried to keep out the sea by building a wall across the mouth of the cave, but they were at length obliged to abandon it, and were unable to return to it until after the re-elevation of the land and the deposition of three feet of shingle. It may be said that, since the time man attempted to stem the incoming tide at Oban, that part of Scotland has been elevated some 35 or 40 feet.

The *Gesellschaft für Erdkunde zu Berlin* is publishing a **Biblioteca Geographica**, containing notices of the books, articles, and maps connected with geography which have appeared within the year. The volume containing the literature for the years 1891 and 1892 has already been issued, and is noticed in the *Magazine*, and the volume for 1893 will be published this year.

The compiler, Dr. Otto Baschin, invites the co-operation of authors and of all who are interested in geographical science, and requests that the following details may be forwarded to him :—(1) name of the author ; (2) the full title of the publication ; (3) the name, number of the volume, and page of the periodical in which the article has appeared, or, in case of books, the place of publication and the name of the publisher ; (4) the number of pages, plates, and maps (with scale) ; (5) the form ; (6) the price ; and (7) the date of publication. When the title does not sufficiently indicate the scope of the work, a short account of its contents is requested that it may be inserted under its proper heading.

Through the generosity of Mr. Henry Beveridge of Pitreavie, £60 has been placed at the disposal of the Dunfermline Burgh and Parish School Boards to secure a series of **geographical excursions** for the older children. All scholars in the Sixth Standard and above it are to benefit by these expeditions, which will be more historical or biological or geological according to the recommendation of each headmaster. The children will be specially prepared in school for some time before each trip, and will be expected to give an account of their experiences afterwards. These descriptions will be examined by the conductor of each party, which will consist of at most thirty children under the charge of, at least, one master and one mistress ; and the authors of the best essays will be selected for other expeditions which will be arranged in the autumn. The excursions already arranged are to Edinburgh, Stirling, Perth, Inchcolm, the Fife coast, Kirkcaldy, and Dysart. Professor Patrick Geddes, Mr. Andrew J. Herbertson, and Mr. T. R. Marr have drawn up the plan of each excursion and will act as leaders.

NEW BOOKS.

The Peoples and Politics of the Far East: Travels and Studies in the British, French, Spanish, and Portuguese Colonies, Siberia, China, Japan, Korea, Siam, and Malaya. By HENRY NORMAN. With 60 Illustrations and 4 Maps. Pp. xvi + 608. London: T. Fisher Unwin, 1895. *Price* 1 *Guinea.*

The question of the East, always interesting, was never more absorbing than at present. Mr. Henry Norman's book most opportunely gives us the impressions of one of the most recent travellers there. He is not one of the globe-trotting journalists who pick up all manner of scraps of information in the shortest possible time, for his present book is the result of four years' travel. He has all the solidity of the serious student, and has the art of the skilled writer to tell his story and present his conclusions in a forcible and interesting way. This makes his book not only important but delightful, and an ideal introduction to the geography of Eastern Asia and its problems.

The main difficulty in reviewing *The Far East* is to do so in less than a dozen pages, for it contains nearly a dozen sections, enumerated in the sub-title, any one of which would form an admirable little book. Mr. Norman is nothing if not frank, and the opinions he forcibly expresses call forth the comments of a reviewer favourable or the reverse.

We may dismiss with a word the descriptions of the decaying Portuguese and Spanish possessions (the latter, he thinks, may ultimately become Japanese), and also his interesting account of the British settlements, when we have called attention to the way in which their development is hampered by the home government, and the need for new administrative processes in the Malay Peninsula.

More scathing chapters have seldom been penned than those on the French colonies, where everything seems to be done to ensure failure, except from the point of view of the functionaries, who number 75 per cent. of the French population, and no doubt draw respectable salaries, the total grant for Cochin China amounting to £360,000 in 1887, while only £16,000 was spent on public works, all of which was allotted to the *personnel* of that department.

A description of Vladivostock, where everything is subservient to military interests, and an account of the Trans-Siberian railway and of Russia's position in the Pacific, ends the part of the book dealing with European possessions.

Of Japan, Mr. Norman has already written his impressions and estimates in *The Real Japan*, but he points out some of the dangers that threaten it in unregulated industrial development, in a prevalent feeling that a century's work can be done in a decade, and in the power of the war party. He crossed Korea by a route seldom traversed by Europeans, from Wönsan to Seoul. His military escort of two soldiers greatly facilitated progress, as everything seems to exist for functionaries in Korea as in Cochin China. "As I had this escort I was travelling as an official, and therefore entitled to demand any services from the people to speed me on my way. The night was pitch dark, and without torches we could not have gone a yard. Therefore the soldiers levied lights from the people." When he asked a soldier to carry his camera for a dollar, the military man did so; but, after a mile, as one in authority he called to some one, "Carry a parcel," and the householder heard it and obeyed. "This process was repeated every few miles, and so my camera was borne by hand across the Hermit Kingdom." The hotels are filthy, and the people degenerate, yet with great possibilities. The present proverb has it: "Given a good meal and a hot floor, and a Korean holds Paradise cheap." The official world depicted in one of Gilbert's operas represents that of Korea with remarkable accuracy.

The contrast between profession and practice struck Mr. Norman quite as forcibly in China, the former being everything that is most desirable, the latter everything that is most convenient. "Every Chinese official, with the possible exception of one in a thousand, is a liar, a thief, and a tyrant." Indeed, little good is said about John Chinaman—"dirt, falsehood, corruption, and cruelty are some of the least objectionable of Chinese vices." The burning of kerosened rats by boys is instanced; but the present reviewer was urged to adopt this drastic procedure the other day as an efficient plan to frighten away rats from a haunt in Edinburgh, and was informed that the champion of this method had seen it tried in Texas with complete success. The pillaging of wrecked boats, and the leaving of the boatmen to their fate might be paralleled by some stories about wreckers off our own coasts not so very long ago.

The white man hates the Chinaman, who, for his part, is contemptuous of "foreign devils," whom he likes the less the better he knows them. "So far from the Chinese growing more sympathetic, in consequence of greater commercial intimacy, they are undoubtedly growing more hostile." Whose fault is it? It was not always so. "Here already (a few hours' journey from Pekin) foreigners are scarce, and I was the centre of much curiosity, keen and inquisitive, but quite good-natured."

Mr. Norman warns us that there is no such thing as China; north and south speak different languages, the far west is not concerned about the far east, "and any sweeping generalisation is almost necessarily untrue." But if the author does not always remember this, he is always pleasant to follow in his walks about Pekin, his trip to the Great Wall, or to the reception room of the great Secretary Li.

In Siam, Mr. Norman had special opportunities of seeing behind the scenes. He soon discovered that the foreign settlements are not Siam, whose centre is in the Royal Palace near which he lived for three months. A Louis XIV. policy has centralised the power in the hands of the king, a monarch of Stewart charm and moral weakness, and his half-brothers who act as ministers, but are most remarkable for their lack of order and persistent procrastination on every possible occasion. The true story of France and Siam is a pleasing and instructive chapter, which should be perused by all interested in our relations with the latter.

Bankok, the Venice of the East, is a picturesque town with a few miles of excellent streets and an electric tramway. The Siamese delight in high festivals, especially funerals and the leading events of the life of the heir-apparent.

One of the most interesting sections of the book is that describing a journey across the Malay peninsula, up the Perak river to Tanjong Mas, south through Banga to Kampong Stah and down the Kelantan river in a raft. Several exciting adventures occurred during this trip. One morning as the traveller rose from his bed, a boa-constrictor rose with him and crawled away, no doubt well satisfied with his night's lodging. He encountered "one of the Sakeis or half-wild men who are to be found in several parts of the Malay peninsula. . . . They live entirely on the roots they dig up with a split bamboo, and the small birds they can shoot with a small bow and arrow or a blow-pipe." Of the uncontaminated Malay himself, Mr. Norman speaks favourably. But much of the interest of the journey was in sailing through Kelantan, the Sultan of which had forbidden any white man to enter or be helped by the natives under grievous penalties. Mr. Norman, however, skilfully forced his way and interviewed the Sultan himself in a proper place, after refusing to go to a half-finished building which was first selected as a fitting rendezvous. This opposition to the white man turned out to be based on the misconduct of a previous white visitor. Kelantan, it is of importance to know, is not one of the Siamese protected States.

The book is full of interesting matter, and if it tends to portray the Eastern world from an Englishman's point of view, yet it is a capable and intelligent observer who gives us many of his impressions in clear, vivid, and picturesque language.

A word must be said in conclusion of the numerous beautiful and effective photographs, mainly from original negatives, and the two maps of the Malay Peninsula and Siam, which Mr. Norman has compiled from various sources of information.

The Story of Africa and Its Explorers. By Robert Brown, M.A., Ph.D., etc. Vol. IV. *Europe in Africa—Colonies and Colonists—The Scramble for an Empire—A Continent under Companies.* With 200 original Illustrations. London: Cassell and Co., Limited, 1895. Pp. 300 and Index to the four volumes. *Price 7s. 6d.*

Dr. Brown's great task is done, and both he and his publishers can be complimented upon the completion of a solid, and, we believe, a lasting piece of work. Looking at the whole work one must be struck by the capacity and erudition of the editor, and the generous and far-seeing character of the publishers' endeavours. It is, indeed, no light task to deal at once, pictorially and verbally, with so vast a subject as that of Africa. Dr. Brown has shown a very powerful grasp of his subject, and although the volumes are intended for general perusal, yet he has not by any means lost sight of the more scientific side of his subject; indeed, he has very wisely blended scientific accuracy with popular phraseology. The artistic merits of the book are very high; we do not say that all the illustrations are of equal merit, either as regards art or instruction; but, taken as a whole, the work is most satisfactory and highly creditable, both in conception and execution. In this, the final, volume the author has had to deal with some very difficult problems; not only has he had to treat of historical facts, but he has had to grapple with the far more debatable subject of present-day politics with reference to colonisation and the scramble by European powers for supremacy in African regions—only a few years ago unknown, uncared for and scorned.

Now Germany, France, Italy, Belgium, Portugal, and Great Britain are claiming territory here, there, and everywhere, and diplomatic crises are continually springing up. Why? Is Africa so very valuable after all? The future alone can tell. As our author states, "unless gold and diamonds are found to be more widely distributed, and in greater quantities in accessible places fit for Europeans, only a small portion of Africa will ever be filled by the outflow of a world which was young while yet it was old." Still it may be that he does not quite take into account the progress of hygiene, and the probable possibility of Europeans being able to live in regions now absolutely obnoxious to them. We agree with him that the southern Europeans are the most likely settlers in Africa just now, but a time may—yes, probably will—come when northern Europeans may colonise there.

The Berlin Conference, the Tale of Two Companies and a Kingdom, and the great experiment with reference to the Imperial British East Africa Company, are all well described, and show far more than a superficial knowledge of the subjects.

The work is one which should be widely read; it should be on the shelves of all public libraries, and would serve admirably for prizes in schools, for it would stimulate the adventurous nature of our youths and educate them as well: whilst for adults the information the work contains will prove of great value.

The perusal of this story will be far more entertaining and elevating than that of an ordinary novel.

A travers l'Afrique Australe. Par Jules Leclercq. Paris: Plon, 1895. Pp. 312.

M. Leclercq has already written books describing his voyages to Mount Ararat, the Caucasus, North America, Mexico, Iceland, the Canaries, Morocco, the Dolomites, the Pyrenees, and Scandinavia. In this volume he details his visit to South Africa, that land of gold and diamonds, for which Frenchmen, like other Europeans, are thirsting as for another Pactolus. Concerning Cape Town, he says that "whilst it occupies a site of marvellous beauty, it is the ugliest town one can imagine." He also calls it a damp and dirty place of abode, and says all reside out of it who can afford a country house. He eulogises, however, its Public Library, founded by Sir George Grey, and its specially interesting collection of printed and manuscript works relative to the races and languages of Africa; and remarks that the smallest town in South Africa has its public library. In the Cape Town Museum he found an admirable collection illustrative of South African fauna, geology, anthropology, etc.

The author was charmed with Wynberg, 40 minutes by rail from Cape Town, with its delicious climate and lovely scenery—whither the Cape Towners escape, after business hours, to their mansions and cottages. Here, in 1795, the treaty was signed ceding the Cape to Britain, and there is the British military station. Farther on is Kalk Bay, the Cape Scarborough; and still farther is Simonstown, the only naval station possessed by Britain in the Indian Ocean south of the Equator. "Every celebrated cape, or famous strait, is sure to be in the possession of John Bull," is the author's reflection.

While Kaffirs form the majority of the electors, only Whites may sit in the Cape Parliament, and these latter may address it either in English or Dutch. This lingual diversity, says the author, "is a deplorable cause of division and weakness," as in Austria and Switzerland. After dining at Mr. Cecil Rhodes' country house (Rondebosch), M. Leclercq writes: "It is a veritable African museum, containing antiquities Mr. Rhodes brought from the ruins of Zimbabwe, and which he generously offered to the Cape Town Museum." "The Plutarch of the 20th century," he adds, "will describe the extraordinary career of this man, who arrived here poor and obscure, and now, at the age of 40, is at the summit of fame and fortune."

M. Leclercq points out the difficulties of South African government, owing to racial distinctions. "The Briton governs; the Boer possesses; the Kafir encumbers. Whilst the Briton annoys the Boer, and the Boer troubles the Briton, the Kafir gets in the way of both. He is very prolific, and increases rapidly." As for the cry of "Africa for the Africanders!" it now means a cessation of racial antipathies, and a South African empire loyal to the British crown. "Resting on its powerful base at the Cape, Britain advances with giant steps on its conquest of all Southern Africa."

The other chapters of this valuable book, on the El Dorado of Johannesburg, the Free Orange State, Natal, etc., are written in the same statesmanlike manner and pleasant spirit, so unlike that shown by the average Parisian *Boulevardier*. The map (by H. Rollet, Paris) is meagre, and such a map as that given with the *Castle Line Almanac*, 1895, would have been much better. There are some interesting illustrations.

The Diversions of a Prime Minister. By Basil Thomson. Edinburgh: Blackwood and Sons, 1894. Pp. viii + 407. With a Map and numerous Illustrations. *Price* 15*s*.

The Tonga Islands and the Tonga people have probably never possessed so sympathetic and yet so impartial an exponent as Mr. Basil Thomson, whose recent

experiences as British representative at the Tongan court have led him to write this book. His coming there in that capacity was due to the previous "diversions" of "the Honourable and Reverend" Mr. Baker, who, as Prime Minister to the Tongan king, had brought the little nation to the verge of bankruptcy. How, after Baker's downfall in 1890, Mr. Thomson was appointed by Sir John Thurston to act as adviser to the native king, not in the guise of a "Prime Minister," but rather as a British Resident, having a seat in the Privy Council, and what was the result of his efforts, may be read in this interesting book. The author only indicates very modestly the tact and skill which he displayed in extricating the native government from the slough into which it had been led, and placing it upon what, with continued careful guidance, would be firm standing-ground ; but one can easily see and admire the discretion and judgment exercised by him in a situation of considerable difficulty.

But the book is really much more than a record of the Honourable Mr. Baker's eccentric proceedings, and of his successor's endeavours to unravel the tangled skein. It is a very full history of Tonga and the Tongans, past and present. And, in addition to the numerous illustrations depicting the existing state of things, there are several reproductions from rare plates of the seventeenth and eighteenth centuries, revealing the condition of the islands at the time of "the coming of the foreigners." (One detail worth noting is that two Dutch plates of 1616 show that the Tongans embroidered the figure of a cock, by way of totem, on the sails of their large canoes ; an emblem which might possibly help to indicate their ancestry.) The chapters on "The Borderland of Myth" and on "Things Anthropological and Zoological" are also very instructive. The map appended to the work is all that could be desired.

Those who have not hitherto known much about Tonga and its people will certainly be aroused by Mr. Thomson's book into sympathy with these interesting islanders. That they should be popularly spoken of as "savages" seems strange when one looks at portraits such as those of George Tukuaho (p. 35), and of Asibeli Kubu (p. 95), the refinement and dignity of whose features can be due to no such recent affair as European influence. One cannot but hope that, in spite of all its difficulties, this little nation of able and intelligent men may succeed in preserving its independence.

Mes Grandes Chasses dans L'Afrique Centrale. By Edouard Foa, Explorateur. Paris : Firmin-Didot, 1895. Gr. 8vo, pp. 340. 76 Figs.

This is an account of sport in the Zambesi country. We are told of the shooting of elephants, rhinoceroses, zebras, hippopotami, buffaloes, elands, antelopes, lions, leopards, hyænas, and many other animals, from caiman and bustard up to monkeys. M. Foa's total bag in three years was 704, of which 319 were big game. He records that a Boer expedition, about the beginning of the century, returned with the spoils of ninety-three elephants in a single season, and laments that the times are changed. We should think that such fell shooting as M. Foa's must go far to sustain the record of the exterminators.

Though the book does not contain much that is new, it is lively and interesting, and there are well-written sketches of various animals from the tse-tse fly to the hippopotamus. Sportsmen will be interested in what is said as to the discovery of game by footprints and other traces, a matter to which M. Foa has paid particular attention ; and there is also an interesting note on the use of an electric projector for illuminating the line of fire during night shooting.

Korea—Eine Sommerreise nach dem Lande der Morgenruhe, 1894. Von Ernst von Hesse-Wartegg. Dresden and Leipzig: Carl Reissner, 1895. Pp. iv + 220.

At a time when affairs in the Far East are attracting so much attention, such a work as the present is a well-timed publication. The author, an experienced traveller and writer, has set forth in a very attractive form his observations and impressions during a visit to Korea as war was breaking out between China and Japan. Approaching the country by steamer from Nagasaki, Herr von Hesse-Wartegg first visited Fusan, which is essentially a Japanese colony. Then continuing his voyage through the Yellow Sea he reached Chemulpo, and thence by sea and river proceeded to Soül, the capital. The difficulties of travel, considerably increased because of the menacing war, are graphically described; and, indeed, the style of the writing throughout is easy and lively—an agreeable contrast to many a German book of travel. The political situation prevented the author from penetrating farther north. He was compelled ere long to return by road to Chemulpo, and retrace his ocean path to Nagasaki. The book contains a great deal of information concerning the habits of the Korean people. Their characteristics are compared and contrasted very effectively with those of the Chinese and Japanese, so that one who has a fairly accurate knowledge of the peculiarities of these peoples will have no difficulty in forming a good mental picture of what the Koreans are. Their government and modes of punishment, their religion and arts, their social life and amusements, their industries and products, all receive a due share of attention. The increasing influence of Russia in the northern parts of Korea is also touched upon—an influence that is certainly beneficial to the inhabitants and cordially welcomed by them. Russia, very naturally, has long had her eye on the desirable harbour of Wönsan, which lies some 400 miles S.S.W. of Vladisvostock. Although geography, in its more technical sense, is discussed, for the most part, only incidentally, Herr von Hesse-Wartegg's book is one of great general interest. It abounds in well-selected illustrations, mostly reproductions of photographs, and is enriched by a good map of Korea and the neighbouring parts of China, Russia, and Japan—as serviceable a "war-map" as we have seen.

La République d'Haïti: Son Présent, Son Avenir Économique. Par Paul Vibert. Paris: Berger-Levrault & Cie., 1895. Pp. 360. *Price 5 frs.*

Although an ardent admirer of the scenery and climate of Hayti, and an enthusiastic sympathiser with its people, M. Paul Vibert is not likely to succeed in arousing similar feelings in the breasts of average Europeans, especially if they hail from the British Isles. He "denounces with indignation" "the lies and the infamous slanders of St. John Spencer, a coward as well as an Englishman—which, after all, is perhaps not a very surprising combination;" and yet he himself says a good deal that really tends to corroborate what Spencer has said. He twice (pp. 184 and 262) refers to Voodoo paganism as a thing in full swing; he paints a most grimy picture of the morals of the clergy (who are Frenchmen, however, and not native Haytians); he tells us of the outrageous prohibitory duties that stifle the commerce of the country; he is perpetually lamenting the absence of railways and the wretchedness of the roads; he shows again and again that Hayti is backward, not because of any natural defect, but because its people have not the energy and knowledge to develop its resources. Forgetting for the moment his anti-British prejudices, he points out that we have transformed the sterile Bahamas into a garden, whereas Hayti, although "a hundred times richer" in its resources, remains practically undeveloped. And yet his dream for Hayti is that it should

become part of a coloured Republican Confederation, comprising all the large islands of the Antilles, not omitting Jamaica—"out of which those Protestant bloodsuckers, those hypocrites and savages, the British, shall have been hunted." Even among his own countrymen, M. Vibert would hardly find many who would regard this as an advance in the direction of civilisation.

Discounting such occasional outbursts of rabid *chauvinisme*, the book contains much precise information regarding Hayti, its *flora* and *fauna*, its industries, its present condition and its future possibilities; information which has not been obtained at second-hand, or in the course of a brief visit, but during a winter spent in the country, and in intimate relation with the people. If the Haytians themselves were to follow the excellent advice of their friendly visitor, the "Black Republic" might really develop some day into an influential and highly-civilised state.

The Story of the L.M.S., 1795-1895. By C. Silvester Horne, M.A. With Maps and many Illustrations. London: Snow & Co., 1894. Pp. 444. *Price* 2*s.* 6*d.*

This is a most useful popular volume, issued in anticipation of the official history of the century's organisation and labours of the London Missionary Society, which Rev. Richard Lovett is writing. The record is a marvellous narrative of highest form of philanthropy among the dark races who form the majority of the human kind, beginning with the South Seas, and expanding over South and Central Africa, Madagascar, India, China, Mongolia, and New Guinea. Robert Louis Stevenson bore impartial testimony to its value in the islands of the Pacific Ocean with which he was familiar, and he delighted in the companionship of the Samoa missionaries. The present writer can, from personal observation, confirm all that is written as to the Society's hundred years' work in India since Forsyth went there a year before William Carey's associates joined him and they met at Chinsurah, and since Mullens, an Edinburgh graduate, left Calcutta to become the Society's secretary, and died in tropical Africa. Nathanael Forsyth was one of the band whom Robert Haldane of Airthrey associated with himself, Dr. Innes, Dr. Ewing, Ritchie, the Edinburgh printer, and Campbell, the Grassmarket ironmonger, to go to Benares as missionaries. Mr. Dundas and the Court of Directors stopped them, but Forsyth went out on his own charges, associated with the London Missionary Society.

Letters and Sketches from the New Hebrides. By Maggie Whitecross Paton. London: Hodder and Stoughton, 1894. Pp. 382. Illustrations and Map. *Price* 6*s.*

In missionary literature this is a unique volume. It will charm those who are most ignorant, and most indifferent or hostile to the spiritual and civilising work done, especially by Scottish missionaries, among the black, brown, and yellow millions of mankind. Here is realism of the purest type, and on the noblest service, rising unconsciously to high literary excellence. Only a woman, and a good and clever woman, could have written these letters.

Supplément au Volume V. du T'oung-Pao. Die Länder des Islam nach chinesischen Quellen. Von Prof. Dr. Friedrich Hirth. Leyden: E. J. Brill, 1894. Pp. 64.

The learned Sinologue has here translated part of the works of Chao Ju-kua, a member of the royal family of Sung, who lived about the beginning of the thirteenth century. He did not himself travel, but as a high official stationed at Amoy he was sufficiently curious to collect a certain amount of information concerning

Mohammedan countries from Chinese traders who had visited them. Some of the statements are quite fabulous. Such, for instance, is the account of a land in the west where the sun disappears with such a noise, that in order to drown it all the musicians of the place begin blowing horns and striking tom-toms just before sunset. If this were not done, women in childbirth would be so frightened at the din made by the sun that they would infallibly die. Under the heading Lu-mei, Rome is supposed to be described, though it is almost impossible to recognise anything in common between the description and the reality, and its inhabitants are said to wear turbans. The points of interest that mainly attracted the attention of the Chinese trader were the richness of the dresses, and the pomp and display of the kings or rulers of each country; the width of the streets; the style of the houses: the food of the inhabitants; their religion and the staple articles of trade. The places described are (in Persia and Mesopotamia) the island of Kish, Basra, Bagdad, Mosul, Kazvin; (in Arabia) Mirbat, Oman, Mekka; (in Africa) Egypt, Alexandria, Berbera, Juba (?), Zanzibar, and as far south as Quiloa; (in the Mediterranean) Rome (?), Sicily, Spain, and Morocco.

Instructions to Observers of the Indian Meteorological Department. By J. Eliot, M.A., F.R. Met. Soc., Meteorological Reporter to the Government of India. Calcutta: Office of the Superintendent of Government Printing, 1894. Pp. iv + 103. *Price* 3 *Rupees.*

Mr. Eliot has prepared a carefully worded description of the instruments used in second and third class meteorological stations in India, and given clear instructions as to the position in which they should be placed, the proper precautions to be taken to keep them in good order, and the necessary details which must be observed in taking readings of them. A special paragraph insists on the need for punctuality, and would lead to the inference that a lax conception of time is one of the difficulties that the Indian Meteorological Department has to contend against, in addition to an occasional attempt of an observer to delegate "a large part of the duties to a messenger or peon for an allowance of, say, two rupees per mensem." But in spite of an occasional lapse of the Eastern natural man into non-scientific ways, the records of this service are admirable and reliable; and this is partly ensured by not leaving to observers the reduction of data, but carrying it out in one of the meteorological offices.

Stanford's Compendium of Geography and Travel (new issue). *Africa: Vol. I., North Africa.* By A. H. Keane, F.R.G.S. London: Edward Stanford, 1895. 8 Maps, and 77 Illustrations. Pp. 624. *Price* 15*s.*

This volume is not a reprint or a revision of Stanford's well-known *Africa*, but the first volume of a completely new work. Only a few passages, which appear as ordinary quotations, remain of Keith Johnston's original work. This volume, after a brief introduction, deals with the Atlas region—Morocco, Algeria, Tunisia, Tripolitana, the Sahara, and the Black Zone; west, central and east Soudan; inhabitants and states of the Soudan; Italian north-east Africa, and Egypt and Nubia.

The author has not given an exactly popular account of his subject; it is handled with great tact, and is perfectly scientific; indeed, few pages can be found which do not contain learned, but very condensed, arrays of facts. Political matters have been taken into account, and one of the author's difficulties in writing the work has been to keep pace with the shifting scenes of political activity. As he says in the preface, "In some instances many carefully-prepared pages have had to be greatly modified and rewritten owing to the unexpected turn taken by events in various parts of the continent."

A wider scope also in this volume is given to the subject of geography than has hitherto been usual; but this is only in harmony with the broader views which now so widely prevail; history, ethnology, and political questions are all dealt with in a succinct yet comprehensible style.

As might be expected from the author, the ethnology is a very strong point, and the classification of the various tribes which he gives throughout the volume are based upon much thought and profound learning.

The illustrations and map are very good, and the print sharp and clear.

A feature in the book which we note with pleasure is the plan adopted of citing the dates of travellers and also of events when dealing with history; this is too often omitted in books of this kind, and although it is thought by some to disfigure the page, its use is far greater than this seeming drawback.

In dealing with political questions, our author seems to be remarkably fair and not in any way biassed.

We think that we have said enough to show that this book deserves great praise, and so much African literature has to be noticed just now that detailed comment is needless.

It should be mentioned that the illustration on page 486 does not represent a "Somali man," but is a portrait of Osman Digma.

The Great Dominion. Studies of Canada. By George R. Parkin, M.A., Hon. LL.D., University of New Brunswick. With Maps. London: Macmillan & Co., 1895. Pp. viii + 251.

Much of the matter contained in this volume will be familiar to our readers, as it was first published in a series of letters to *The Times*. But we ought to be grateful to the author for having again laid before the public, in this revised and enlarged form, his views on subjects of daily-increasing importance to the British citizen, for surely Mr. Parkin's opinions are entitled to careful consideration. As might be expected, the author of *Imperial Federation* lays special stress on the political significance of Canada to the Empire. Her naval stations close to coal mines, both on the Atlantic and the Pacific; her facilities of communication across the American continent; her essential relations to the maritime position of the Empire, are brought out in strong relief. But the bulk of the book is devoted to a review of the economic and social condition of Canada with reference to Great Britain. The resources of each province and its fitness for settlement are fully dealt with. Canada is not a place for the head-worker; but for domestic servants, agricultural labourers, and especially farmers with some capital, there is still plenty of scope. While the North-West is essentially a poor man's country, farmers with capital have a good chance in the Eastern Provinces; but it requires men used to hard work, and the young Englishman of the better class, sent out to Canada fresh from the public school to be a farmer, is not a success. To men with capital, energy, and common sense in business, British Columbia, with its gold and silver mines, its rivers abounding in salmon, and its timber forests, affords many opportunities. The English manufacturer should take to heart what Mr. Parkin says on page 205: "He must make up his mind to turn more and more—and he might as well do it without grumbling—from the lower to the higher forms of manufacture." On the whole, Mr. Parkin takes a very hopeful view of the prospects of the Dominion. He assures us that, with the idea of commercial union with the United States, also that of annexation to the States has vanished, and he comes to the conclusion that "it is Canada's highest interest and the prevailing wish of her people to maintain connection with the Empire, and that she cannot be separated from it without

results incalculably hazardous to the maintenance of the national position of the British people."

Outlines of English Industrial History. By W. Cunningham, D.D., and Ellen A. M'Arthur. Cambridge: University Press, 1895. Pp. xii + 274.

This little work—one of the *Cambridge Historical Series*, edited by Professor Prothero—deserves to be widely read. It may be recommended (1) to members of the general reading public, who will thus fortify themselves against the present excess of vague theory in industrial problems; (2) to the ordinary student and teacher of English history, who will thus gain a ready insight into the life and well-being of the nation in the past; and (3) even to the specialist in economic history, who may know something of the larger works of Professor Cunningham, and those of Professor Ashley and others. Only one book, we think, has been published of recent years in this country of similar compass and with the same design, and we are doing it no injustice when we advise that this one be substituted for it.

The method of the book is topical rather than chronological. Thus, after some introductory chapters, the towns, finance, agriculture, labour and capital, and other features of national economic life are dealt with separately, and with little of that repetition which might be expected. Thorold Rogers' *History of Agriculture and Prices* ought to be mentioned (if any work should) on pp. 6-7. The writers give, perhaps, too much credit to Edward III. personally in their treatment of his times. For a small work of this kind, Professor Cunningham's historical justification of the mercantile system seems too much pressed. Vague assertion occasionally takes the place of definite information. There is a useful chronological table.

Egypt. Handbook for Travellers. Edited by Karl Baedeker. *Part First: Lower Egypt and the Peninsula of Sinai.* With 14 Maps, 7 Views, and 7 Vignettes. Third Edition, revised and augmented. Leipsic: Karl Baedeker, 1895. Pp. 280 and Index. *Price* 12*s.*

The former editions of this handbook are well known, and much appreciated by all travellers. This new edition will only serve to add both interest and pleasure to a stay in the land of the Pharaohs. The revision has been very well done, and a considerable amount of new matter introduced. We have gone over the work with some care, and find few sections where emendations do not occur, notably in the historical parts, and the practical details of travel have also been carefully brought up to date. The maps and plans are excellent, and much as yet unpublished material has been utilised. The book can be with every confidence warmly commended.

Leitfaden der Geographie für höhere Lehranstalten. Von Dr. R. Langenbeck, Oberlehrer am protestantischen Gymnasium zu Strassburg. Leipzig: Wilhelm Engelmann, 1894. 2 Teile. Pp. viii + 125 and vi + 340. *Price* 2 *M.* 10 *Pf.*; boards, 2 *M.* 40 *Pf.*

These two volumes are not, as geographical schoolbooks are only too apt to be, mere collections of names and figures, but they aim at conveying interesting information in as attractive a form as possible. The author has certainly been very successful in this, and some chapters are quite models of lucid and graphic style. The learner is not overwhelmed with isolated facts, but an attempt is always made to show the causal relation between the different phenomena. An interesting feature is the distribution of the subject matter according to the forms of a German Secondary School, and the book thus gives a very good idea of what a German

schoolboy is required to know at the different stages of his geographical education. In the elementary volume definitions of geographical terms are given when these are employed for the first time, and an index at the end enables the learner to refer to them. The second part contains, scattered through the volume, a good deal of information on the commercial importance of the different countries and their commercial relations with one another. In a future edition this subject would deserve revision and enlargement, and, above all, an index should be added, for at present the student has no means of systematising his knowledge of commercial geography. Contrary to a much prevailing fashion, the book is not illustrated.

L'Afrique: Anthologie Géographique. Par NOËL GARNIER. Paris: Delagrave, 1894. Pp. 566. *Price* 4 *Frs.*

This volume forms one of a handy series of Anthologies of the various continents. It may be termed a descriptive geography of Africa, composed of extracts from the works of the leading French authorities, or from contemporary publications. The first part consists of a description of the Physical Condition of Africa, the second of its Peoples, and the third contains an outline of the Geographical History, more particularly of recent discoveries. Such books are excellent helps to all teachers of geography, who often find vivid and accurate accounts which help greatly to increase the interest of a lesson, without the impossible amount of reading necessary without such anthologies.

D'Alger à Tanger. Par MARIUS BERNARD. 120 Illustrations, par A. Chapon. Paris: Henri Laurens, N.D. Pp. 388. *Price* 10 *Frs.; bound,* 13 *Frs.*

The author has published three volumes on *Les Côtes barbaresques*, of which this is the last. Another was reviewed in the *Magazine* of last year.

M. Bernard visited the principal towns in the north of Algiers, and made excursions in the interior to Ghardaïa and Figig, after which he sailed for Morocco, where he visited Fez, Mekinez, and Tangier. His narrative contains a little of everything—political notes, scraps of history, characteristic incidents, descriptions of scenery, native customs and ceremonies, etc. It conveys, in a popular style, a good idea of the country and its inhabitants as they appear to the European traveller. The language is sometimes rather abrupt, and occasionally somewhat turgid, but the large class of readers who desire instruction, but like plenty of variety and shun dry discussions, will find the book as a whole exactly to their taste. The illustrations are well executed and instructive, and the type and paper are exceedingly good.

Two other series are to be published—the one on *Les Côtes Latines* and the other on *Les Côtes Orientales* of the Mediterranean.

Bibliotheca Geographica, herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von OTTO BASCHIN unter Mitwirkung von Dr. ERNST WAGNER. Band I. Jahrgang 1891 und 1892. Berlin: W. H. Kühl, 1895. Pp. 506.

Since 1853 the *Zeitschrift* of the Berlin Geographical Society has published a more or less complete bibliography of geographical literature. Now, however, instead of this bibliography contained in the *Zeitschrift* it is the intention of the society to issue it in a separate form. The first volume lies before us, and we most heartily congratulate our sister society on the very excellent manner in which the task has been carried out. We hope that it will continue to be issued in its present form, and it will be of the greatest use to all geographers. Type and printing are all that can be desired.

NEW MAPS.

EUROPE.

SOUTH DEVON. By John Bartholomew, F.R.G.S. New Reduced Ordnance Survey of England and Wales. Scale, 2 miles to an inch. *Cloth*, 2*s*.

London: W. H. Smith and Son.

This map is uniform with the well-known sheets of Scotland. It includes West Looe and Plymouth, and extends northwards to Exeter and Launceston.

NORDOSTSEE-CANALES, Special-Karte des ——. Massstab 1 : 200,000. Mit einer Uebersichtskarte für den Nordostsee-Canal.

Deutsche Rundschau für Geographie und Statistik, Jahrg. xvii. Heft 8.

ASIA.

CENTRAL ASIA AND AFGHANISTAN, Wyld's Military Staff Map of ——.

London: G. W. Bacon and Co.

The part of Asia represented in these four sheets stretches from the Sea of Aral and Issik-kul to Beluchistan and Northern India. It contains a large number of names, and routes are clearly shown. No date appears on the map, but the new Anglo-Russian boundary is shown, and therefore certain changes on the north-western frontier of India should also have been made—for instance, the boundary of Kafiristan should have been drawn so as to include Asmar. The scale should have been printed on a map of this size : it appears to be 32 miles to the inch.

AMERICA.

CHILI, Carte Commerciale du ——. Dressée par F. Bianconi, Ingénieur-Géographe. Échelle de 1 : 2,500,000. *Librairie Chaix, Paris*, 1894.

This is the second of these useful maps that has been noticed in these pages. As an ordinary topographical map of Chili this sheet would be very useful. It also shows the forests and the crops raised in different parts, and the nitrate and other mines in the north. The railways have been carefully brought up to date—in one case beyond the present date, for we are not aware that the line from Ovalle extends at present further southward than San Marco. Good maps of South American countries are very rare, and therefore this map of Chili should find many purchasers.

ATLASES.

ENGLAND AND WALES, The Tourist's Pocket Atlas of ——, with Descriptive Gazetteer. By J. G. Bartholomew, F.R.G.S.

SCOTLAND, The Tourist's Pocket Atlas of ——, with Descriptive Gazetteer. By J. G. Bartholomew, F.R.G.S. *London: John Walker and Co.*, 1893.

Messrs. Walker have sent us these atlases very opportunely at the beginning of the tourist season. They contain the whole of the island in sectional maps, besides numerous large-scale maps of particular districts. The latter are the more important feature, and might, perhaps, be added to with advantage. The west of Yorkshire and Derbyshire, for instance, are well worth a visit, and might have been represented on a special map. The gazetteers contain much information in a very compressed form.

SIR JOHN FRANKLIN

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

NOTES ON FRANKLIN'S ARCTIC EXPEDITIONS.

By W. Scott Dalgleish, M.A., LL.D.

(*With a Map and Portraits.*)

(*Read at the Franklin Commemoration Meeting in Edinburgh, June 4th.*)

Franklin made in all three expeditions to the Polar region of North America. The first and second were land-journeys; the third and last was a sea-voyage.

1. *First Expedition—Overland Journey.*—His first overland journey occupied the years 1819-1822. He had previously had experience as an Arctic explorer, having been associated with Captain Buchan in an expedition sent out by the British Government in 1818 to seek for an approach to the North Pole between Spitzbergen and Greenland, a route which is now being prosecuted by Nansen, and which, in the opinion of many scientists, holds out the best hopes of success. The reputation Franklin acquired in that voyage, not only for seamanship and scientific skill, but also for intrepidity, endurance, and resource, led to his selection as the leader of a small party sent out in 1819 to explore the Arctic Coast of North America from the land side. That is to say, he was to make an overland journey from the west coast of Hudson Bay to the mouth of the Coppermine River, and was then to survey the coast in an eastward direction.

At the same time, the *Hecla* and the *Griper* were sent out, under Lieut. Parry (afterwards Sir Edward Parry) and Lieut. Liddon, to explore the seas west of Baffin Bay. The intention was that the two expeditions should, if possible, act in concert.

At that time nothing was known of the Arctic Coast of America east of Icy Cape (Cook, 1778) in 162° W. long., except the mouth of the

Coppermine River (Hearne, 1771), and the mouth of the Mackenzie River (Mackenzie, 1789). Practically, the whole of the North Coast was a *terra incognita*, when Franklin entered on his task.

Lieut. Franklin, then in his thirty-third year, sailed from the Thames on May 23rd, 1819, and he did not reach York Factory, on the west coast of Hudson Bay, till August 30th. His companions were Dr. (afterwards Sir John) Richardson and Messrs. George Back and Robert Hood—names now stamped indelibly on the charts of the Arctic Archipelago.

The party started from York Factory on September 9th, 1819. Travelling by way of Cumberland House, they reached Fort Chippewyan, on Lake Athabasca, on March 26th, 1820, and there they remained till July 18th (about four months). They then continued their journey to Fort Enterprise, which was reached on August 20th, and there they passed the winter (nine months).

They started again in the summer of 1821, and on July 18th they encamped on the shore of the Arctic Ocean, at the mouth of the Coppermine River.

The outward journey thus occupied 678 days, or one year and ten months. That was the time that had elapsed since their departure from Hudson Bay; but only one-fourth of that time was spent in travelling. As a rule, the year of the traveller or voyager in the Arctic regions is divided into two very unequal portions—the one, of three months spent in exploring, the other, of nine months spent in winter quarters. The distance traversed on foot and by canoe was upwards of 3000 geographical miles.

Three days after their arrival, they launched their canoes on the Arctic Ocean, and they explored the coasts of Coronation Gulf and Bathurst Inlet, its southern branch, as far as to Point Turnagain, which was reached on August 18th. During the month, they explored 555 geographical miles of coast; and that was the practical outcome of the expedition.

The failure of their food supplies and tempestuous weather compelled them to retrace their steps. When they left Point Turnagain, instead of returning to the mouth of the Coppermine River, they made for the Hood River, paddled up that river to the first cataract, and thence struck across country in a south-westerly direction to Fort Enterprise.

Their sufferings on this return journey—from lack of food, from intense cold, and from dangerous accidents,—were extraordinary and almost unparalleled. Sometimes they had not the means of making a fire. For days all they had to subsist on was the *tripe de roche*, a nauseous and noxious lichen. All their canoes were rendered useless. The putrid carcase of a deer found in the cleft of a rock was regarded as a godsend. For days together their only diet consisted of the injurious lichen aforesaid, varied with old shoes and scraps of leather, and cast-off deer skins. Stories of murder and cannibalism among their Canadian escort added to the horrors of the situation. Several of their Canadian voyageurs died from exhaustion and starvation. On more than one critical occasion, the party was saved from death by friendly Indians.

When at length they reached Fort Providence, the severest part of

their trials came to an end; but it was not till July 14th, 1822, that they returned to York Factory, having traversed a distance of 5550 geographical miles, in two years, ten months, and eight days, of which only one month was spent in exploration of the coast.

II. *Second Expedition—Overland Journey.*—Franklin's second overland expedition occupied the years from 1825 to 1827. Its object was to explore the coast of North America west and east of the mouth of the Mackenzie River, so as to fill up the gap between Icy Cape and the mouth of the Coppermine River, explored by Franklin in his former journey. Dr. Richardson was again his companion; and it was arranged that, while Franklin traced the coast westward from the Mackenzie River, Richardson should take the eastward beat.

Captain Beechey, in the *Blossom*, was to sail through Bering Strait, in order to meet Franklin, if circumstances were favourable.

Nothing daunted by the terrible sufferings which he had recently experienced, Franklin—now a Captain—cheerfully undertook the supreme command of the expedition.

He sailed from England in February 1825 for New York, whence he travelled through the United States and Canada to Cumberland House, which was reached on June 15th. Having been joined a fortnight later by the rest of his party, which had come by way of Hudson Bay and York Factory, he travelled by the same route as on the first journey, to Fort Resolution on Slave Lake. But thence the party took a north-westward course, till they struck the Mackenzie River at Fort Simpson. They proceeded down that river to Fort Norman, whence one party, under Lieut. Back, was sent to prepare winter quarters on the shore of the Great Bear Lake; while another party, under Dr. Richardson, went to explore the north shore of the lake. Franklin, with the remainder, continued his journey northward, and on August 16th—only sixty days after leaving Cumberland House—he reached the mouth of the Mackenzie River, and the shore of the Arctic Ocean, which was found to be free of ice, and to be literally swarming with seals and black and white whales.

Having deposited a message there for Captain Beechey, in the event of his reaching the place by sea, the party returned to the Great Bear Lake, where they met Dr. Richardson, and where Mr. Back had prepared at Fort Franklin three houses for the accommodation of the whole party, numbering fifty souls, during the winter. [During Franklin's absence, Mr. Drummond, the Assistant Naturalist, had been sent by Richardson to the Rocky Mountains at the head of Athabasca river. Starting in June 1825, he rejoined Richardson at Cumberland House in April 1827, having obtained considerable collections.]

At Fort Franklin about ten months—Sept. 5th till June 24th—were passed pleasantly and comfortably enough, although on one occasion the thermometer sank to 49° below zero (Fahr.)—81 degrees of frost.

The plans for the summer campaign were as follows:—

(1.) Franklin and Back were to explore the north coast westward from the mouth of the Mackenzie River—if possible to Icy Cape.

(2.) Richardson and Kendall were to explore the coast eastward to the mouth of the Coppermine River.

(3.) Dease was to remain at Fort Franklin, and to lay in provisions for the next winter.

The two exploring parties started from Fort Franklin on June 24th, 1826. They parted at the bifurcation at the head of the delta of the Mackenzie River; and on July 7th Franklin's party reached the coast, and at once began operations. Their westward progress along the coast was retarded by bad weather, ice-floes, and fogs, while they were tormented by mosquitoes.

In spite of these obstacles and difficulties, Franklin succeeded in tracing the coast westward for 374 miles, to a point which he named Cape Beechey, in honour of the captain of the *Blossom*. But he did not meet the *Blossom*, for it had stayed its eastward voyage when within 160 miles of Franklin's farthest.

Franklin's party returned to the mouth of the Mackenzie, and there they were saved by friendly Eskimo from a wholesale massacre planned by hostile Indians. At Fort Franklin, they were delighted to meet Richardson's party, which had surveyed no less than 863 miles of coast, between the mouth of the Mackenzie and that of the Coppermine River. By way of the latter river they returned to Fort Franklin in September.

The whole party spent a second winter, of five months, at Fort Franklin, or in its neighbourhood. The cold was intense, the lowest temperature recorded (in February 1827) being 58° below zero—90 degrees of frost.

Franklin, with a small party, left Fort Franklin on February 20th, 1827, and arrived, without misadventure, at Cumberland House in June. There he was rejoined by Dr. Richardson, and they travelled together to Montreal and New York, and arrived in England on September 26th, after an absence of two years and seven-and-a-half months.

Among the honours conferred on Franklin was the gold medal of the Paris Geographical Society; and on April 29th, 1829, he received the distinction of knighthood.

Franklin's first wife (Eleanor Anne Porden) had died six days after he left England in 1825. On November 28th, 1828, he married Jane Griffin—the Lady Franklin whose devotion and perseverance we all know.

Eighteen years elapsed between Franklin's second land-journey and his final and fatal voyage to the Arctic regions. These years were spent by him partly on the Mediterranean Station, as commander of the *Rainbow*, and partly as Lieutenant-Governor of Van Diemen's Land (Tasmania), a post which he held for seven years (1836-1843).

III. *Third Expedition—Sea Voyage.*—In 1845, Sir John Franklin accepted the command of an expedition projected by Government for the discovery of the North-West Passage, which seemed then to be within reach. Since Franklin's second land-journey, the gaps he had left on the north coast had been filled up. Beechey had explored the coast between Icy Cape and Point Barrow. Dease and Simpson, officers of the Hudson Bay Company, had explored the coast from Point Barrow to Cape Beechey —Franklin's farthest on the west. The same explorers had traced the coast eastward from Point Turnagain—Franklin's eastern limit—to Back's Great Fish River: and, crossing Simpson Strait, had reached the southern coast of King William Land. The point now to be determined

LADY FRANKLIN.

was, whether there was a practicable channel from Simpson Strait in the south to Barrow Strait in the north. If there was, the North-West Passage would be discovered.

Franklin's expedition consisted of two ships—the *Erebus* and the *Terror*,—already well-tried, and famous in connection with Sir James Ross's Antarctic explorations. Sir John Franklin flew his pendant in the *Erebus*, with Captain Fitzjames as second in command, while Captain Crozier commanded the *Terror*. The crews numbered 134 officers and men. They were convoyed by a transport ship, the *Baretto Junior*, which was to deposit stores at Disko Island (Greenland). The little squadron sailed from the mouth of the Thames on May 20th, 1845, and finally left the British Isles, at Stromness, Orkney, on June 3rd—fifty years ago yesterday.

They doubled Cape Farewell on June 24th, and left Disko Island on July 10th; and the ships were last seen by a whaler—the *Enterprise* of Peterhead—in Melville Bay, Greenland, on July 26th, when all was going well.[1]

When two years passed without any tidings of Franklin, search expeditions began to be organised. Other three years elapsed, however, before any definite traces of the explorers were discovered. These were found in 1850 on Beechey Island, off the south-west coast of North Devon, by Captain (now Sir Erasmus) Ommaney and Captain Penny. They consisted of a pile of meat-tins[2] filled with gravel, and of three graves with rough tombstones; but no record was found, though diligent search was made. In 1854, Dr. Rae reported to the British Admiralty that he had purchased from a party of Eskimo a number of articles which had undoubtedly belonged to Franklin and his party, including Sir John's Star or Order, part of a watch, silver spoons and forks with crests, and other articles.[3]

At length, in 1859, Captain (now Admiral Sir Leopold) M'Clintock, and Lieut. Hobson, in the steam-yacht *Fox*, equipped by Lady Franklin, found near Point Victory, on the west coast of King-William Land, a very valuable record, in the shape of a "bottle-paper." It contained a two-fold message—the one occupying the body of the paper, the other written round the margin.[4]

The original record, dated May 28th, 1847, was written by Lieut. Graham Gore, who had led an exploring party along the coast of King-William Land to Cape Herschel, probably within sight of the northern mainland. It confirmed Ommaney's report of the wintering of the ships at Beechey Island (though it erred by a year in the date). As Gore's party returned to the ships, then beset by ice to the NW. of King-William Land,

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1 Two members of the crew of the *Enterprise* still survive—Mr. J. Brand of Peterhead (carpenter), and Mr. Thomas Yule, Roanheads (steersman).

2 The number of tins found was far in excess of the possible consumption of the expedition; and it was inferred that a fraudulent contractor had supplied the Government with putrid meat.

3 These are in the Rae Collection, and were shown in the Society's Franklin Exhibition.

4 A facsimile tracing of this record was shown in the Society's Franklin Exhibition. Also relics presented by Dr. D. Walker, Surgeon of the *Fox*, to the Liverpool Museum of Natural History.

they must have been able to assure Franklin, before he died, that the great object of his quest had been accomplished.

The second message, signed by Crozier and Fitzjames, was dated April 25th, 1848, after the ships had been abandoned. It intimated the death of Sir John Franklin on June 11th, 1847, and mentioned that the party of 105 survivors would start next day for Back's Fish River.

The facts, thus gleaned from various sources, may now be briefly narrated in their proper order.

After leaving Melville Bay, in the end of July 1845, the *Erebus* and the *Terror* sailed through Lancaster Sound and Barrow Strait. They sailed up Wellington Channel and down Crozier Channel between Cornwallis Island and Bathurst Island, to Barrow Strait again. The ships returned to Beechey Island, where they spent the first winter (1845-46). In the summer of 1846 they sailed down Peel Strait, between North Somerset and Prince of Wales Land, and down Franklin Strait west of Boothia Felix, to a point NW. of King-William Land, where they spent the second winter (1846-47).

In May 1847, Lieut. Graham Gore explored the west and south coasts of King-William Land, and returned to the ships.

In June 1847 Sir John Franklin died on board the *Erebus*. As was said in *Punch's* commemorative poem :—

> "Not under snow-clouds white,
> By cutting frost-wind driven,
> Did his true spirit fight
> Its shuddering way to Heaven ;
> But warm, aboard his ship,
> With comforts at his side,
> And hope upon his lip,
> The gallant Franklin died."

The third winter (1847-48) was spent off Point Victory, at a point to which the drift of the ice had carried the ships.

In April 1848 the survivors (105 in number) abandoned the ships, and started, under Captain Crozier, to make the overland journey to the Great Fish River,—"the river of their hope."

Before long, the party is supposed to have divided. The weaker section returned to the ships, and were lost with them. The stronger section crossed from King-William Land to Adelaide Land, where their remains were found, at Starvation Cove, in 1869. Their line of retreat was marked by skeletons and graves. No vestige of the *Erebus* and *Terror* was ever found.

It may be mentioned as a matter of local interest, that in 1879 Lieut. Schwatka (U.S. Navy) found on the north of King-William Land the remains of a Scotsman, Lieut. John Irving of the *Terror*, who in 1848, with Crozier, had found at Point Victory the "bottle-paper" record left there by Graham Gore in 1847. Irving's remains, identified by a medal bearing his name, were buried at Edinburgh with fitting ceremony in January 1881.

The results of Franklin's last and fatal expedition did not cease with his death. Some forty search expeditions, due chiefly to the per-

MAP OF
FRANKLIN'S
ARCTIC EXPEDITIONS
to illustrate
Dr Scott Dalgleish's Paper.
English Miles
Coast known before Franklin's 1st Journey.
" explored by Franklin and Party 1819-22.
" " " " " " 1826-27.
" " " " " " 1845-47.
" " between Franklin's 2nd and 3rd expeditions.
1st Journey 2nd Journey 3rd Journey.
Winter Quarters
ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
ALASKA
NORTH WEST TERRITORY
MACKENZIE RIVER
ATHABASCA
SASKATCHEWAN
ALBERTA
KEEWATIN
NORTH EASTERN TERRITORY
HUDSON BAY
JAMES BAY
GREENLAND
BAFFIN BAY
DAVIS STRAIT
HUDSON STRAIT
FOX CHANNEL
GULF OF BOOTHIA
MELVILLE SOUND
BARROW STRAIT
LANCASTER SOUND
PARRY ISLANDS
Melville I.
North Devon
Banks Island
Prince Albert Land
Prince of Wales Land
Victoria Land
Wollaston Land
King William Land
Cockburn Land
Boothia
North Somerset
Bylot Island
Baffin Land
Cumberland
Fox Land
Southampton Island
Melville Peninsula
North Lincoln
Yukon R.
Mackenzie R.
Great Bear L.
Great Slave L.
Athabasca L.
Peace R.
Churchill R.
Nelson R.
Red River
Winnipeg
Fort Simpson
Fort Norman
Fort Resolution
Fort Chipewyan
Fort Vermilion
Fort Dunvegan
Fort Edmonton
Fort Carlton
Fort Pelly
Fort Ellice
Fort Garry
Fort Churchill
Fort Severn
Fort Albany
Moose Factory
Martins Falls
Mistassini
Rupert R.
Abitibi L.
Lake Superior
Lake Winnipeg
Lake Manitoba
Lake Winnipegosis
Lake Athabasca
Great Slave L.
Great Bear L.
Reindeer L.
Cumberland House
Hudson House
Isle a la Crosse
Portage la Loche
Methye Portage
Fond du Lac
Chipewyan
Slave Lake
Dease L.
Dease R.
Liard R.
Fort Liard
Fort Halkett
Fort Nelson
Fort Simpson
Fort Norman
Fort Good Hope
Fort Rae

sistent devotion of Lady Franklin, who equipped four of them at her own expense, added very greatly to our knowledge in detail of the Arctic Archipelago, and led directly to the triumphant solution of the problem of the North-West Passage by M'Clure in 1850-51. There is a well-known saying (attributed to Tertullian) that "the blood of the martyrs is the seed of the Church." With no less truth may it be said, in view of Franklin's fate, and of subsequent explorations, that the bones of the pioneers are the stepping-stones of Discovery.

THE LABRADOR PENINSULA.

By Robert Bell, B.A.Sc., M.D., LL.D., of the Geological Survey of Canada.

(*With a Map and Illustrations.*)

Boundaries.—The Labrador peninsula forms the large eastern division of the mainland of North America. In latitude, its centre is midway between the Gulf of Mexico and the northern extremity of the continent at Bellot Strait. It lies between Hudson Bay on the west and the North Atlantic Ocean on the east, with Hudson Strait on its northern side. The dividing line between this great peninsula and the rest of the continent has not yet been authoritatively defined, but it may be assumed to extend from the mouth of Rupert river at the southern extremity of Hudson Bay to Lake St. John at the head of the Saguenay river and fiord, the distance across this neck of land being about 350 statute miles.

Dimensions.—As thus defined, the southern point of the peninsula at Tadousac on the St. Lawrence is in latitude 48° 10′ and the northern extremity, Cape Wolstenholme, on Hudson Strait, in latitude 62° 35′. From this cape the shore runs nearly east for 150 miles. The length of the peninsula from north to south is therefore about 1010 English statute miles. A line drawn from Tadousac to Cape Wolstenholme would run nearly north-north-west, and measure about 1070 statute miles. The eastern coast from Belle Isle, in latitude 52°, up to latitude 53° 30′, runs due north, on the meridian of 55° 40′. On the opposite, or Hudson Bay, side of the peninsula, the sea-coast in the same latitudes also runs due north, and corresponds with the meridian of 79°. In latitude 53° the peninsula will therefore have a breadth of 1015 English statute miles. Cape Jones, where James Bay opens out into Hudson Bay proper, is in longitude 80° and is the most westerly point of the peninsula. A line drawn from the Strait of Belle Isle to Cape Jones would measure 1065 statute miles, so that Labrador is practically as broad as it is long.

Area.—The superficial extent of the Labrador peninsula has been roughly estimated at 420,000 square miles. Unless geographical miles

are intended to be understood in this estimate, it is far too low, for I find on making a careful computation of the area of its surface, following the figure of the earth independently of any map-projection, that its total extent within the boundaries above defined, and including the lakes, is very close upon 560,000 square English statute miles. In making this computation, I used the areas of quadrilaterals of the earth's surface for each degree of longitude in each degree of latitude. This is 4000 square miles greater than the areas of Great Britain and Ireland, France, Germany, Belgium, and Holland combined. The nearest point of this great region, so little known to the British public, is less than 2000 statute miles from the western shore of Ireland, Belle Isle being only 1750 geographical miles from Malin Head in the northern point of that island. The whole peninsula is, of course, under the sovereignty of Great Britain. Newfoundland claims about 140,000 square miles, the remaining 420,000 belonging to Canada. In the following pages, when the name Labrador is used, it is to be understood as designating the whole peninsula. Throughout the maritime provinces this region is called *The* Labrador.

Sources of Information.—Although many books and papers have been written about various parts of the Labrador peninsula, and numerous maps have been published showing portions of its coast-line, the writer is not aware of any general map and description of the whole region, giving the results of all the explorations and investigations which have been made up to the present year. The following general account of the country and the accompanying map are intended to supply this want, as far as possible. It may be as well, however, for me in the first place to mention the opportunities I have had of obtaining the necessary materials to enable me to write upon this subject. In 1875-77 I explored and partly surveyed the western side of the peninsula, or East Main coast of Hudson Bay, from its southern extremity nearly to Mosquito Bay. In 1880 I passed through Hudson Strait in the *Ocean Nymph*, belonging to the Hudson Bay Company, and on that occasion had close views of many places along both shores. I was naturalist and medical officer to the expedition sent out to Hudson Strait and Bay by the Government of Canada in 1884-85 in the steamships *Neptune* and *Alert*, and had opportunities of visiting the southern or Labrador side of the Strait and of exploring the east coast of Hudson Bay from Cape Wolstenholme southward towards Mosquito Bay, thus leaving only a limited gap between the part then examined and that which had been explored in 1877. It should be here mentioned, that in the course of these different explorations of the East Main coast, I made limited excursions inland in numerous places, either on foot or by the rivers, which were sufficient to give me a good idea of the character of the country away from the coast. Since 1877, Mr. A. P. Low of the Geological Survey has made surveys of East Main river and parts of Big river, Little and Great Whale rivers, and Clearwater river. While going out or returning by the *Neptune* in 1884, and the *Alert* in 1885, a near view of almost the whole of the eastern Labrador coast was obtained, and we also landed at a few points. In 1858 I assisted in an exploration

From Photograph by Dr. Bell.

DR. BELL AND PARTY, WITH GROUP OF ESKIMO, AT POWNGA
(About 20 miles S. of Cape Wolstenholme).

of Lake St. John and the Saguenay, and in 1868 I coasted in a small schooner all the way from the Saguenay to the Strait of Belle Isle and ascended some of the rivers for short distances.

Having seen so much of Labrador myself, I have been the better able to obtain and to appreciate the large amount of valuable information in regard to it which I have derived from personal intercourse with a number of people who have a knowledge of various parts of the region. These include traders, explorers, missionaries, fishermen, etc. Among them I may mention Mr. John M'Lean, author of *Twenty-five Years' Service in the Hudson Bay Territories*, who traversed Labrador several times, and whom I met frequently at Elora in Ontario, whither he had retired; the late Captain William Kennedy, the Arctic explorer, who was agent for the Hudson Bay Company at Fort Chimo and George River Fort in Ungava Bay, and at old Fort Naskopie in the eastern interior; Sir D. A. Smith, who resided many years on the eastern coast; Messrs. Robert Crawford, Peter M'Kenzie, and Keith M'Kenzie, who have successively had charge of Fort Chimo; Mr. Lucien Turner, who was agent at Ungava for the Smithsonian Institution from 1882 to 1884; the six gentlemen who had charge from 1884 to 1886 of the three government meteorological stations at Cape Chidley, Prince of Wales Sound, and Cape Wolstenholme, especially Mr. R. F. Stupart, now Director of the Meteorological Service of Canada, and Mr. F. F. Payne of the same service; also Mr. William Skynner, of the Observatory at Nachvak, on the east coast, south of Cape Chidley; Rev. E. J. Peck of the Church Missionary Society, who crossed the northern part of the peninsula from Richmond Gulf to Ungava Bay, and kindly furnished me with a copy of his itinerary and map; Mr. J. G. A. Creighton of Ottawa, who made an exploration for the Geological Survey between the Gulf of St. Lawrence and the head of Hamilton Inlet; also several of the officers of the Hudson Bay Company, lately resident on the eastern coast, and some of the Moravian missionaries whom we visited on that coast in 1884.[1]

Low and Eaton's Explorations.—But I am more particularly indebted to Mr. A. P. Low of the Geological Survey, and his assistant, Mr. D. I. V. Eaton, for scientific information as to the interior. In 1893 these gentlemen made a traverse through the central portion of the whole peninsula from Lake St. John, by way of Lakes Mistassini and Nitchiquan, and the Kaniapiskow lake and river to Ungava Bay. On their arrival at Fort Chimo they fortunately caught the Hudson Bay Company's annual steamer, *Eric*, bound for Rigolet on Hamilton Inlet, and they spent most of the winter at the North-West river post of the Company, near the head of the inlet. During the spring and summer of 1894 they

[1] The following positions were determined in 1890 by Mr. William Ogilvie, Dominion Topographical Surveyor, who received the Royal Geographical Society's medal for his exploration of the Yukon river (*S.G.M.*, vol. vii. p. 211):—Rupert's House, lat. 51° 29′ 27″, long. 78° 45′ 00″; East Main Post, lat. 52°, 14′ 44·91″, long. 78° 29′ 15″, or 5 h. 13 m. 57 s.; (Residence) Moose Fy., lat. 51° 14′ 43″, long. 80, 35′ 00″. The position of the Hudson Bay Company's post on East Main river was ascertained with the closest accuracy, while the other determinations are very good, and certainly the best existing.

surveyed the Hamilton river to Lake Petitsikapow, where the upward course of the river turns from a north-westerly to a southerly direction. They then surveyed Michikamow lake and a route thence southward by Atikonak and Ossokmanowan lakes and the Romaine river to the Mingan Islands on the north shore of the Gulf of St. Lawrence. Messrs. Low and Eaton's explorations for 1893 involved perhaps the most arduous journey hitherto undertaken by officers of the Geological Survey, and their work of 1894 also proved difficult in contending with snow and slush in spring, and afterwards on account of the great number and the rough character of the portages which the explorers were obliged to cross. Both the above journeys were performed with small canoes, which in the spring of 1894 were hauled over the snow before the opening of navigation. Game was scarce, and fish caught in gill-nets each night constituted their principal food. These gentlemen deserve much credit for their perseverance in successfully carrying out the above work in Labrador. Believing that their names should be recorded in the region of their explorations, I have placed them on the two lakes lying to the north-west of Lake Michikamow, as shown on the accompanying map.

The Eastern Coast.—The best-known portion of the peninsula is the eastern coast, which in the popular mind is generally associated with the name Labrador. A good summary of our knowledge of this region is given in Dr. A. S. Packard's *The Labrador Coast*, published in New York in 1891, and I have had some correspondence with the author on matters discussed in his book. I have also had access to the older books and maps which have been published on the subject of Labrador. From all the foregoing sources of information, which include the most recent, it is proposed to give in the following pages a succinct general account of the Labrador peninsula which shall convey as much definite and substantial information as may be possible in the space devoted to it.

General Description.—The Labrador peninsula may be described in a general way as a moderately-elevated plateau of Archæan rocks, hilly, interspersed with many lakes, and having a surface partly of swamp and bare rock, and partly overspread with boulders and coarse glacial *débris*, rendering the greater portion of it unfit for cultivation. Its sea-borders are rather abrupt all round, except in a few sections, where the country is low for some distance inland. In three parts of its coast-line, ranges of mountains or great cliffs and hills of rock rise directly from the sea. The first and highest of these follows the whole Atlantic border, which has a length of 760 statute miles. The next is a range of mountains and precipices from 500 to 2000 feet in height overlooking Hudson Strait, and running along the whole of the most northern coast, which stretches from Cape Hope's Advance to Cape Wolstenholme, a distance of 270 statute miles. The third mountainous section is that part of the western coast which lies between Cape Jones and Cape Dufferin and has a length of 350 miles. Here the hills or mountains rise to heights of 1000 to 2000 feet, within a short distance of the sea nearly all along. The southern shore from the Saguenay to the Strait of Belle Isle cannot be

said to be mountainous, although in most parts it rises rapidly as you go inland, in a succession of rocky hills.

The shores of Ungava Bay are low all around, with the exception of some small hills of rock about the mouth of the Koksoak river. A low tract of country extends westward from this bay across the peninsula to Mosquito Bay; and the western coast is mostly quite low from the latter bay southward to Cape Dufferin. All the way from Cape Jones to Rupert Bay the shore is less rocky than elsewhere on the East Main coast, and as a general rule it rises gradually from the sea. A large tract, shown on the accompanying map, extending inland from the east side of James Bay, appears to be less than 600 feet above the sea, except, perhaps, in a few places. Most of the country between Rupert Bay and the Saguenay, forming the neck of the peninsula of Labrador, is hilly, with an elevation in the central part of about 1500 feet.

General Elevation of the Peninsula and of the Interior Plateau.—The general elevation of the interior plateau is probably not far from 1800 feet above the ocean. Professor H. Y. Hind states it at 2240 feet, which is probably too great. Mr. Low estimates the mean elevation to be 1500 feet, which may be more nearly correct as an average for the whole peninsula, allowing for the diminution which would be caused by taking into consideration the low level of the tract around Ungava Bay and of the greater part of the northern division, as well as the moderate elevation of the district on the east side of James Bay. But these low areas may be fully compensated for by the excess in the elevation of the north-east coast range and the high ground inland from the mountainous part of the East Main coast, so that, taking together the low tracts on the one hand and the mountainous portions on the other, their mean elevation may not be far from that of the general plateau.

The mean of the estimates of Hind and Low is 1870 feet. Mr. Low gives the height of Lake Mistassini as about 1350 feet above the sea, but the surrounding country is considerably higher. He ascertained by the aneroid barometer that Lake Nitchiquan, at the source of Big river, has an elevation of about 1800 feet and Lake Kaniapiskow of about 1700 feet. These two lakes are in the centre of the peninsula, but not far to the south-west of the former the hills rise to a height of 500 feet, and to the north-east of the latter to 700 feet, above the canoe route. Lake Michikamow, a short distance north-east of Grand Falls on the Hamilton river, cannot be far from 1500 feet above the sea, and Mr. Low says "it is surrounded by barren rocky hills from 200 to 700 feet in height." Bryant, by means of a standard compensated aneroid, found that the highest point in the neighbourhood of Grand Falls was only a little more than 1500 feet above the sea, but the general elevation of the country increases considerably to the north-westward. If we add 200 feet for this increase and the same for the general altitude of the country above the surfaces of the four lakes just mentioned, we shall find the average to be 1770 feet. The tops of the higher hills within sight of the coast between Cape Jones and Dufferin are about 2000 feet high, and the general elevation probably increases to the north-eastward

as far as the height of land, about midway to Ungava Bay. Caley gives the elevation of a hill near the upper part of the Moisie river, in the southern portion of Labrador, as 2214 feet above the sea. From the foregoing considerations, and until a greater number of facts are available on which to base more exact calculations, we may assume that the average elevation of the Labrador plateau, if not of the whole peninsula, is about 1800 feet above the sea.

Archæan rocks similar to those of Labrador continue to the south and west of Hudson Bay, but with a diminishing elevation and a less sterile surface: and, in connection with the subject of these general levels, it may be mentioned that on the canoe routes between the Bay and Lakes Huron and Superior, the watershed has an altitude of about 1000 feet above the sea in nearly all cases, and the general elevation of the height of land in this region is 200 or 300 feet higher.

Mountains.—The chain of mountains along the eastern side of Labrador is scattered and ill-defined from the Strait of Belle Isle to Hamilton Inlet, but northward of this great fiord it becomes more regular. At first it is broad and low, but becomes narrower and higher as we proceed up the coast, till it has attained its maximum elevation in the interval between Saglek Bay, 140 statute miles south of Cape Chidley, and the Four Peaks, 70 miles south of the same cape. From this highest part the general elevation diminishes northward to Cape Chidley, where it is about 1500 feet. The peaks just mentioned are represented on the Admiralty charts as having elevations of 6000 feet, and numerous other points in the 70 miles to the south of them appear to be at least equally high. In Dr. S. Weiz's map of the north point of Labrador (1868), a ridge to the west of the Four Peaks is represented as 8000 feet high. Dr. R. Koch, who spent the winter of 1882-83 at Nain, says: "The highest points of this range are opposite the island of Aulatsivik (Aulezavik or Aulalsivik), and reach elevations of from 8000 to 9000 feet." This range is the highest ground in British America east of the Rocky mountains.

The mountains forming the northern part of the chain have not been glaciated like the rest of Labrador, and they present steep sides with jagged crests rising out of the cold sea. Patches of snow remain in sheltered places throughout the year. Here in summer there is great richness and variety in the colouring and atmospheric effects, so that the scenery is beautiful, as well as grand. Indeed it can hardly be excelled in any part of the world.

In the interior there are no distinct mountain ranges, and the heights of land between the different drainage areas are not marked by sharp elevations, but, as in other Archæan regions in Canada, they generally constitute the most level belts. The hills are mostly unconnected, irregular, and of endless variety of profile and basal form. In other parts of the great Archæan area of Canada, the glaciation has been more intense, and the resulting surface may be said to be mammalated, but this description does not apply so well to Labrador.

Lakes.—Lakes are thickly scattered over the Labrador peninsula, as

they are in the glaciated Archæan regions of Canada in general. There is, however, an absence of any very large bodies of fresh water, such as are to be found on the opposite side of Hudson Bay. A few of the largest are about 100 miles long, while a dozen others measure something like half that length, and lakes of 20 or 30 miles are quite numerous. Lake Mistassini, in the southern part, has been surveyed and found to measure almost exactly 100 miles, along its gentle curve, by a width of 15 miles in the middle; but as it narrows regularly towards each end, it may not have as great an area as some of the shorter but wider lakes of the peninsula. Lake Mistassinis, parallel to its south-east side and close to it, is about 66 miles long, but it has no great width. Payne lake (so named by the late Captain A. R. Gordon, R.N., after the observer F. F. Payne, who first ascertained its position, etc.) is situated in the opposite or northern part, and is reported to be about 20 miles long by 25 wide. If this be the case, its area is probably greater than that of any other lake in Labrador. Big Seal lake is said to be about 90 miles long and 20 wide, which would make it second in point of area, judging from the outlines of these two lakes as represented on the sketch-maps, as well as from their assumed lengths and breadths. Michikamow lake, the largest in Eastern Labrador, was surveyed by Messrs. Low and Eaton, and found to measure 55 miles from north-west to south-east, independently of some long bays which may give it a total length of 75 miles. Its greatest width exceeds 20 miles, and Mr. Low thinks its area may surpass that of Lake Mistassini.

Two principal lake regions occur in Labrador, the eastern being situated around the headwaters of the Michikamow or Grand Lake river, the Hamilton and the George rivers; while the western one lies inland from the great recess of the East Main coast. The eastern group embraces the following lakes: Michikamow (the Great or Grand lake), Low, Eaton, Waquash, Nattecamahagan, Petitsikapow, Naskopie, Flour, Sandy, Ossokmanowan, Ashwanipi, and Atikonak.

The lakes of the western group discharge their waters principally by the Nastapoka, Clearwater, and Little Whale rivers. Clear (or Clearwater) lake is the most accessible of the group. Mr. Low surveyed a canoe route from Richmond Gulf to the outlet of this lake and found the distance to be 50 miles in a straight line, but he did not explore the lake itself. The four large lakes in this region, as represented on the accompanying map, are taken from sketches, with notes, made for me by two intelligent Indian hunters named Crow and Shem Williams. From their descriptions, Clear lake would appear to have a length of about 90 miles, Big Seal lake of about 100, Little Seal lake of about 75, and Apishagami of about 50 miles. Apishagamish (Little Apishagami) discharges by both Great Whale and Big rivers, while Big Seal lake seems to discharge into Clear lake as well as by the Nastapoka river. Kenogamissie (Little Long lake) and Height-of-Land lake, both said to be large sheets of water, also belong to this group. On the sketch-map of this region, obtained by Rev. E. J. Peck from his Indian guides, Northern Seal lake is represented as a wide stretch of

water, which would have a length of about 35 miles. Its centre would be about in latitude 57° 20′ and longitude 75° 30′. It probably discharges by a river the mouth of which I located in 1877 ten miles north of the Nastapoka.

Clear lake is remarkable for the great transparency of its waters, and, like all the other lakes of the region, it abounds in fine fish. These attract numerous seals, which ascend by way of the Nastapoka river. Mr. Low says the Indians told him that Big Seal lake is much larger than Clear lake, and that it is surrounded by a low, flat country, totally barren. Mr. Peck mentions the same thing in his journal. It may be inferred, partly from this information, and partly from the shape of the northern part of the lake itself, that Silurian rocks possibly occur around it. Another circumstance which favours this supposition is the fact that on a hill of Laurentian gneiss (like that of the surrounding country), 200 feet in height, near the outlet of Clear lake, Mr. Low found a boulder of light-coloured limestone containing corals of Upper Silurian or Devonian age. The direction of the drift was from Big Seal lake towards this point.

Among the remaining lakes of Labrador which deserve mention are Erlandson's lake, so called by Mr. John M'Lean after a German of that name in the employ of the Hudson Bay Company, who, in 1834, was the first white man to cross the country from Ungava Bay to Hamilton Inlet, then called Eskimo Bay. Mr. M'Lean, from having walked several times over its whole length upon the ice, estimated it to be fully 40 miles long, with an average breadth of two miles and a half. Mr. Low gives the length of Lake Nitchiquan (Knee lake) at about 30 miles and of Kaniapiskow at about 40 miles, with a narrow part about the middle.

Mr. Peter M'Kenzie of the Hudson Bay Company, formerly resident at Fort Chimo, informed me that at about 15 miles north-west of the mouth of the Ungava river, an opening in the coast leads into a large lake close to the sea, which is affected by the tide and may be entered by schooners. Leaf lake, said to be 70 or 80 miles west of Fort Chimo, is reported to be a large sheet of water, but no authentic information can be obtained in regard to it. Grand and Kenamou lakes, in eastern Labrador, are also considerable sheets of water of which little is known.

Many of the lakes of Labrador, including Michikamow, have two outlets, often to the opposite sides of the watershed, and Clear lake is represented by the Indians as having three discharges, of which one divides into two. Double outlets are of common occurrence in our Laurentian lakes in general, and the frequency of this phenomenon helps to prove the comparative freshness in geological time of the surface of the great Archæan region of northern Canada.

Rivers.—On the Archæan plateaus of Northern Canada generally the rivers do not flow in deep or well-defined valleys, but are prone to spread over the country in straggling channels. I found good examples of this condition on the upper parts of the English, Attawapishkat, Albany, and Nelson rivers. Mr. Low observed a similar character in the upper parts

From Photograph by Jas. L. Cotter.

ENTRANCE TO RICHMOND GULF IN WINTER.

of the East Main and on the Hamilton river above Grand Fall. In all these regions the streams must be flowing not far below the general level of the surrounding country. Branches will run off unexpectedly on either side and after a course of 5, 10, or 50 miles will rejoin the main stream. This phenomenon of the Archæan regions of Canada is one of the evidences of the shortness of the period during which the present surface has existed. Denuding agencies have affected it but little, and the rivers have not yet had sufficent time to excavate distinct valleys for themselves.

Four Drainage Areas in Labrador.—The annual precipitation throughout Labrador appears to be as great as in Ontario and Quebec, and consequently the country abounds in streams and rivers. The peninsula has four drainage areas or river systems: (1) a northern, discharging into Ungava Bay and Hudson Strait: (2) a western, into Hudson Bay; (3) a southern, into the River and Gulf of St. Lawrence; and (4) an eastern, into the Atlantic Ocean.

The northern drainage system is the second in point of area, and its greatest river, the Ungava or Koksoak (Big river), has a length of about 400 miles in a straight line, or upwards of 500 following its general course. Fort Chimo, a trading-post of the Hudson Bay Company, is situated on the east side of this river, about 20 miles from its mouth at the bottom of Ungava Bay; the banks of the river in this interval being high and rocky. The spring-tides rise 40 feet at the mouth of the river, and are felt for about 70 miles up, or as far as The Forks, some 50 miles above Fort Chimo. The western branch is called the Stillwater or Natwakame, and the other the South, and farther up the Kaniapiskow, river. The 70 miles, or thereabouts, of the united rivers below The Forks is all that may be called the Ungava or Koksoak river proper, although the longest branch, or South river, gives the stream a total length of about 400 miles, as above stated. About 120 miles above Fort Chimo a large branch falls into South river, on the east side, called Swampy-bay or Waquash river, which is followed as part of the canoe-route to Hamilton river and Michikamow lake. Above this branch South river becomes the Kaniapiskow. A few miles above this tributary the river expands into a lake 25 miles long and from 2 to 5 miles wide, surrounded by rugged mountains. Mr. Low named it Cambrian lake, from the age of the rocks in these mountains. A short distance below, and again not far above, this lake, the river passes between perpendicular walls 1000 feet high, and is here full of rapids and falls. Farther up, in about latitude 56°, it plunges through another gorge, which Mr. Low named Eaton cañon, after his assistant, in which it falls 350 feet in one mile. Above this cañon the country for about 70 miles is hilly, some points rising 500 to 700 feet over the river; but in approaching Kaniapiskow lake it becomes flat, with occasional ridges.

According to Rev. E. J. Peck, the Stillwater or Natwakame branch, which he followed from the height of land near Big Seal lake, is a large river, and easy to descend in canoes. It is greatly increased by the influx of the Kenogamissie, which rises south of Apishagami lake, and flows in from the south about 40 miles above The Forks.

Any descriptions which we have of the other rivers of Ungava Bay are too indefinite to be worth repeating at length. George river is a very large stream, and flows almost due north throughout its whole course, and it rivals the Ungava in length. Whale river, between these two, is also an important stream. The river which discharges Payne lake, and which may be called Payne river, is said to have a considerable breadth and a course of about 50 miles through a flat country. Mr. Stupart, in coasting along Ungava Bay in 1885, noticed a good many Eskimo living at Tuvik, where it enters the sea, a short distance north of the Bay of Hope's Advance. Two rivers enter Prince of Wales Sound, and a third flows into an inlet about ten miles west of Cape Prince of Wales. Mr. Stupart's men found its banks clothed with willow bushes of a larger size than usual in this region.

The second or western drainage area is the most extensive, and has a breadth in the centre of 500 miles, this being the distance in a straight line from the source of Big river to James Bay; while Great Whale river to the north and East Main river to the south of it are almost equally long. If the general courses of these streams were followed, their total lengths would probably prove to be fully 600 miles. Rupert river in the south has a course of 230 miles in a direct line from Lake Mistassini, which it drains. Northward of Great Whale river the height of land constantly approaches nearer to Hudson Bay, and the streams become progressively shorter all the way to Cape Wolstenholme. The principal ones in order, going north, are Little Whale, Clearwater, Nastapoka, Northern Seal (the outlet of the lake of this name), and Langlands. A beautiful perpendicular fall of about 100 feet occurs at the mouth of the Nastapoka, and another of about equal height at the mouth of the Langlands.

Notwithstanding their magnitude, none of the rivers of the east coast of Hudson Bay is of any value for navigation, except by canoes or light boats. Most of them are obstructed by falls close to their mouths, showing that this coast has been elevated above the sea in comparatively recent geological times. On the Great Whale, Big, and East Main rivers, the first falls are a few miles from the sea; but the distance in each case is too short to be worth utilising for navigation. Every river is broken throughout its whole course by falls and rapids at irregular, but generally short, intervals; and these necessitate portages in ascending or descending in canoes.

The third or southern drainage area has a more uniform breadth than any of the others. Counting it as extending from Lake St. John on the west to the Strait of Belle Isle on the coast, we find it to include fully 50 good-sized rivers. The largest of them are the Outarde and the Manicouagan, which enter the St. Lawrence almost together at about 90 miles below the Saguenay. Each of them has a length of upwards of 200 miles in a straight line; but owing to the great bends in their upper branches, the general course of either would measure at least 300 miles. The Betsiamites or Bersimis, about 25 miles nearer the Saguenay, is an almost equally large stream. Like the rivers of the western drainage area, all those of the southern slope descend too rapidly to be

From Sketch by Dr. Bell.

MOUTH OF LITTLE WHALE RIVER, LOOKING EAST.
(North Bluff and H. B. Company's Post.)

utilised for navigation by crafts larger than canoes. The greater number of these south-flowing rivers are more or less valuable for their salmon and trout fisheries. Perhaps in no other part of the world is there such a large number of salmon rivers on a single coast-line.

On the eastern side of Labrador the height of land is too near the coast to admit of the formation of large streams, except towards the south, and therefore the only long rivers of the fourth or eastern drainage basin are those in that direction. They are three in number, and all fall into Lake Melville, which forms the upper part, or the continuation, of Hamilton Inlet. Two of them enter this lake directly opposite to one another, at about 20 miles from its head. The one from the north is called North-West river. It divides into two branches above Grand lake, the western being the Michikamow, flowing from the lake of the same name, and the other the Naskopie. The river coming in from the south is the Kenamou, which has two principal branches, of which the western drains Lake Kenamou. But the largest of the three is the Hamilton river, which enters the head of Lake Melville, its valley being a further continuation of that of the Inlet itself. This river has become noted for its splendid fall, to reach which was the principal motive for the exploration of the river by three different parties in recent years. It was also visited by Mr. Low in the course of his geological explorations in 1894.

Although Grand Falls did not attract much attention before these explorations began, their existence has been long known to the officers and men of the Hudson Bay Company. Mr. John M'Lean, who in 1849 published his *Notes of Twenty-five Years' Service in the Hudson Bay Territories*, visited Grand Falls in 1839, when on a canoe journey southward from Ungava Bay, and gave an excellent description of them in his book. He did not state their height, but after the time of his visit they were popularly supposed to be much higher than they really are; and Captain Kennedy (referred to on a previous page) was accustomed to speak of them as "The Thousand-feet Falls."

The vague accounts which were current of their wondrous grandeur have induced several gentlemen within the last few years to try to reach them. The first of these was Mr. Randle F. Holme, of England, who made the attempt in 1887, but did not succeed. In 1891 two parties from the United States managed to reach the falls. One of them was the Bowdoin College Expedition, which entered the mouth of Hamilton river on the 27th of July; and Messrs. Austin Cary and D. M. Cole of this party arrived at the falls on the 13th of August. The other expedition of 1891 was that of Mr. Henry G. Bryant of Philadelphia and Professor C. A. Kenaston of Washington. They entered the Hamilton river on the 4th of August, and reached Grand Falls on the 2nd of September. Mr. Low arrived at the falls on 3rd May 1894. His description in the *Summary Report of the Geological Survey of Canada for* 1894 gives us a clear conception both of the falls themselves and their geological relations. From it we learn that the falls occur where the river precipitates itself from the plateau lying to the northward into the lower level of an ancient valley or cañon running inland from the sea. There is a perpendicular fall of 316 feet (Bryant's measurement)

into the head or north end of a narrow gorge. This is a zigzagging branch which runs in nearly at right angles from the north wall of the much greater cañon, in which the river flows the remainder of the distance to the sea. Above this branch-gorge, the great cañon was seen to continue on for 25 miles to the north-westward, although it is not now occupied by any considerable stream. The comparatively still river of the plateau, on reaching a pool 4 miles above the falls, rushes down a descent of 200 feet as a strong rapid to the great leap. Below the latter it continues to descend as a boiling torrent about 300 feet more in the branch cañon, within a distance of 5 miles in a straight line, although its crooked course may have a length of 10 miles; so that the total descent in 9 miles will be about 900 feet. On emerging into the great cañon, the river turns south-east and flows as a heavy rapid, which does not freeze in winter, for fifteen miles to Big-hill portage, where the canoe-route to Grand Falls leaves the cañon, and follows a chain of small lakes on the north-east side. Fifty miles below Big-hill portage the river enters a still portion called Winokapow lake, 40 miles in length. At the mouth of the Minipi branch from the south, 40 miles below the outlet of this lake, the general course, which has been very straight, changes from south-east to east-north-east. At Gull rapids, 60 miles from the mouth, the river emerges from the cañon, and a sandy plain intervenes between the river and the rocky hills on either side, all the way to Lake Melville. Hamilton river, therefore, flows 145 miles in the main cañon, which, with the 10 miles in the zigzagging branch-gorge and the above 60, make a total of 215 miles by the river from Grand Falls to the mouth. In order to commemorate the visit of one of the expeditions from the United States, Mr. Low proposes to call the branch-gorge below Grand Falls Bowdoin cañon. The fifteen-miles torrent below it might be called Bryant rapid, in honour of the leader of the other expedition of the same year.

According to Mr. Low's description of the river, if we make the most moderate allowance for the descent in the various rapids and swift parts, in addition to the drop of 800 feet at and above and below the Grand Falls, we shall find the total descent to be about 2000 feet from the commencement, 4 miles above the falls, to the sea. Above the former locality, he says the hills average 300 feet above the river, which would make the general elevation of the country in that region about 2200 feet. The mean between this and Bryant's elevation (1500 feet) of the highest point near Grand Falls would be 1850 feet, which agrees pretty well with our previous estimate of 1800 feet for the general altitude of the interior plateau.

Cañons and Fiords.—The sides of the cañon of Hamilton river vary from about 500 to 1000 feet in height, and are generally nearly perpendicular. The face of the rocky walls, which consist of the common gneiss and granite or syenite of the country, is everywhere fresh and sound, showing that the cañon has not resulted from the decay or erosion of the country rock. I have no doubt that its formation has been due to the decay, in pre-glacial times, of a great dyke, or of several parallel

dykes of greenstone close together. It would, therefore, be similar to many of the narrow valleys now occupied by long lakes and rivers—stretches in the Archæan region northward of the great lakes of the St. Lawrence and the Winnipeg basin, which I have shown to have originated in this way. Above the permanent water-line, the coarse diorites, diabases, etc., of large dykes decay and crumble rapidly, leaving the walls intact. During the glacial period the deeply-decayed or softened greenstone was easily scooped out by the forward and undulatory movement of the glacier, even when the line of the dyke was at right angles to the direction of the ice-flow.

The great depth of the Hamilton river cañon proves that the land stood at a much higher level before the glacial epoch, but its length is no measure of the time required for its excavation, since this would be performed by ice almost as rapidly in the case of a long dyke as a short one. The cañon has been partly refilled with the glacial *débris* forming the bed over which the present river flows, except, perhaps, at Lake Winokapow, which both Bryant and Low found to have a depth of over 400 feet. The bottom of the ancient valley would, therefore, be below the present level of the surface of the river by this amount, if not more; for even the flow of this lake may consist of glacial drift. From this lake downward the old valley would deepen all the way to the sea.

Various observers have noticed large quantities of greenstones along the river and around Hamilton Inlet, especially near its entrance, as well as elsewhere in this part of Labrador. The dyke or dykes of this rock, out of which the cañon of the river is believed to have been excavated, must be concealed from view in the bottom of the gorge, except as occasional patches, which I have no doubt will be found clinging to the walls in many places. Although the eastern coast of Labrador has been very imperfectly explored, a few cañons, on a smaller scale and excavated on the courses of dykes of intrusive greenstone, have been already noted, and larger ones will very probably be brought to light when this coast becomes better known. M'Lean refers to a high fall (near which he camped) on the North-West river, below Michikamow lake, "which is here walled in by inaccessible precipices on both sides. The view above the fall is interrupted by stupendous rocks. The natives say the appearance of the river and surrounding country is the same from this fall to Michigama (or Michikamow) lake." This description would seem to indicate that Michikamow river flows in a cañon similar to that of Hamilton river.

The Saguenay fiord and river afford another example of a great cañon evidently excavated along a group of parallel dykes, or on a single great dyke of greenstone, of which others are known to cut the gneiss in the adjacent country. Mr. Low has traced the upward continuation of this valley under the drift through the basin of Lake St. John and for a considerable distance to the westward of it. The general course of the Saguenay cañon is nearly parallel to that of Hamilton river.

A part of the Moisie river is described as running in a similar gorge, having a nearly north-and-south direction, and Mr. Low describes the lower part of the Kaniapiskow river as flowing in a cañon which has a

corresponding bearing. These two gorges lie nearly in one straight line, and they may possibly follow different parts of the same great rift.

Hamilton Inlet (including Lake Melville) is the greatest fiord of Eastern Labrador and runs in for 150 miles from the ocean. Northwards from it the whole coast is serrated with long fiords, several of which run in 40 to 50 miles from the general line of the coast. The water in them is deep; valleys continue inland from their heads, and they are flanked by mountains or high hills of ancient crystalline rocks; in all of which respects they resemble the fiords of Norway and Greenland. They evidently occupy very ancient valleys, which have required a vast length of time for their erosion—so vast that it may have extended back to a pre-Cambrian time, as we shall point out in noticing briefly the geology of Labrador. For 170 miles northward of Hamilton Inlet the fiords run south-west, but from thence to Cape Chidley the inward course of all of them is due west.

Geology of Fundamental Rocks. *Laurentian System.*—The prevailing rocks throughout the peninsula of Labrador are gneisses and granites or syenites of Laurentian age, and, as far as they have been examined, they have been found to belong to the older part of the system. If the foliation of the gneissic portions be due simply to pressure, it will be difficult to draw a line between these and the non-foliated or granitic rocks of this region. Hornblende granite prevails along Mr. Low's central route from longitude 71° 30′, on the East Main river, as far as and around Kaniapiskow lake. In the next 100 miles, or nearly to the Cambrian area, to be noticed further on, he found grey and pink banded hornblende and mica gneisses, and dark coarse mica and hornblende schists. Granite or syenite was also the prevalent rock around the northern and southern parts of Michikamow lake, between this lake and Ossokmanowan lake, including the region around Grand Falls, and thence southward all along the route followed to the Gulf of St Lawrence. Granite was the principal rock met with on an exploration by Mr. Low between the south branch of Great Whale river and the lower part of Big river. He also found a small area of this rock at the "jog" on East Main river, about longitude 76°, and another around Obutigamu lake south of Lake Mistassini. The rocks of the eastern coast from Chateau Bay for 70 miles northward are chiefly granite. Massive anorthosites containing iridescent labradorite occur in the central part of Michikamow lake; on the Moisie, Romaine, and St. John river, and on the Atlantic coast at White Bear Arm, Hamilton Inlet, Paul Island, Nain and Port Manvers.

In the basins of the Bersimis and Saguenay rivers, in the southern part of the peninsula, the Laurentian gneisses and other rocks of the series resemble those of the Ottawa valley and probably belong to its newer portion. On the Bersimis, and again on the Ashonapmouchouan, between its falls and forks, Mr. Low found small bands of white and pink crystalline limestones like those of the Ottawa valley. After making allowance for the areas of massive rocks above mentioned, and for those of newer rocks about to be noticed, it may be said that the greater part

of Labrador is built up of Laurentian gneiss. The micaceous and hornblendic varieties are about equally common, and they embrace many shades and textures of greyish and reddish colours. The strike has not yet been ascertained in a sufficient number of places for purposes of generalisation, but in the great majority of the known cases on both the eastern and western coasts it is north-westerly, while on both sides of Hudson Strait it is about due east and west. On the upper part of the East Main river it has also the same direction. This is a somewhat remarkable circumstance, since in the region north of the Ottawa and between the great lakes and Hudson Bay, the prevailing strike is everywhere about south-south-west.

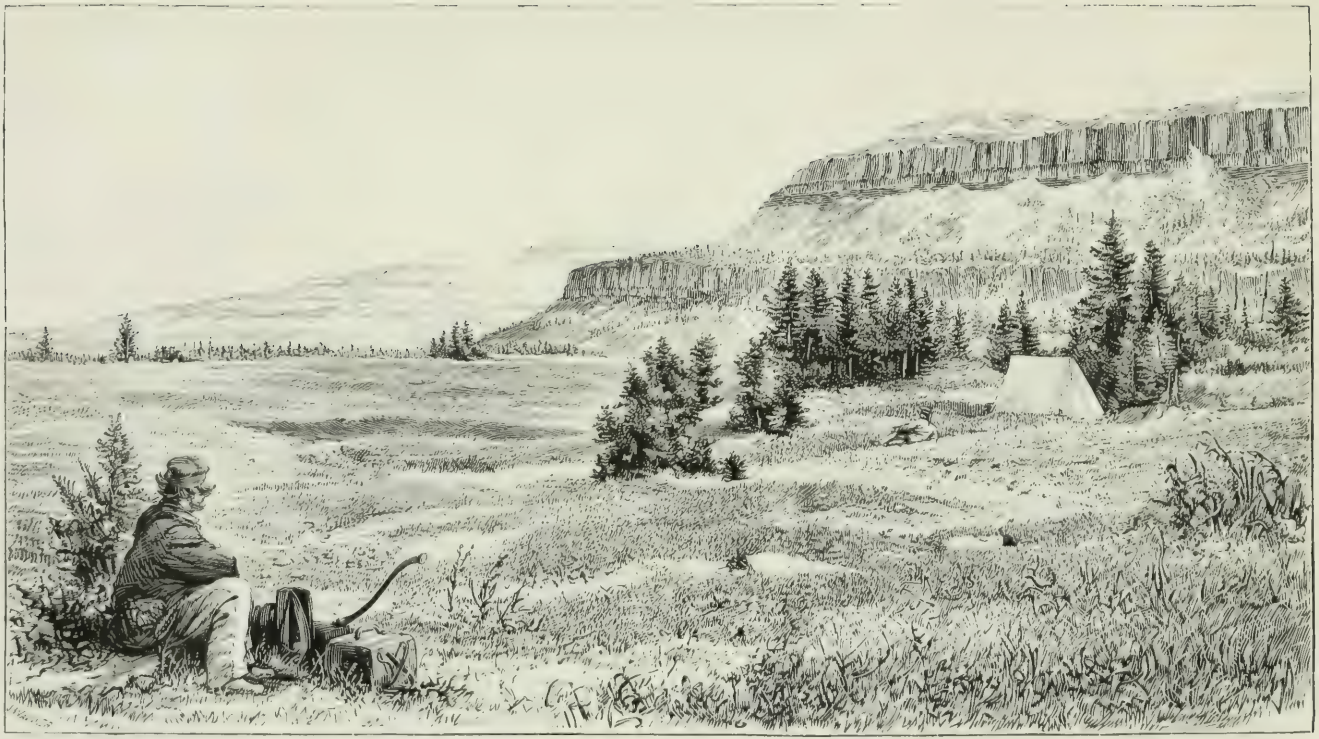
Huronian System.—This geological system in Canada is of interest and importance, being pre-eminently a metalliferous series, and it also contains various economic minerals of a non-metallic character. Unfortunately, it appears to occur but sparingly in Labrador. In 1877 I described a belt of hornblendic and siliceous schists which comes out upon the coast of James Bay at Cape Hope, just north of East Main river. Since then, Mr. Low has found out that this belt runs due east up the river for about 200 miles, with a breadth of about 15 miles. At Paint hills, 40 miles farther north, or in latitude 53°, another band of Huronian rocks comes out to the coast. It consists of hornblendic, micaceous and siliceous schists and a conglomerate having a micaceous matrix enclosing well-rounded pebbles of granite and siliceous schist. Greenish Huronian schists occur on the south side of Richmond Gulf, and the Eskimo make their kettles and lamps of a steatitic schist, probably Huronian, which they find on the coast to the south of Mosquito Bay. Running south-westward from the southern extremity of Lake Mistassini, there is an important band of Huronian strata, consisting of a variety of bedded volcanic or pyroclastic rocks. This band is the north-eastern extremity of the Great Huronian belt, which runs all the way from the lake just named to the outlet of Lake Superior, a distance, on its general course, of 700 miles. A large area of these rocks extends southward from the extremity of the Cambrian belt in the vicinity of the great elbow of the Hamilton river. Smaller areas were seen on the Ashwanipi branch of this river and at Sandy lake, also at Pospiskagami lake on Great Whale river, and on the upper part of East Main river, about longitude 72°. Huronian rocks are reported to occur on the headwaters of the Outarde and Manicouagan rivers. M'Lean says there is greenstone 60 miles up George river, and that "very fine slate succeeds." On the Atlantic coast I found rocks which may be referred to this system between Nachvak and Ramah, among them being felsitic flag-stones and fine-grained siliceous schists. The Eskimo name of Davis Inlet means "plenty of kettle-stone," which is a soft schist belonging to the series under consideration. Belle Isle was found by Dr Selwyn to be formed of a variety of Huronian rocks resembling those of the Lake Huron region. Similar rocks occupy large districts in Newfoundland.

The "Domino gneiss" of Mr. Lieber (geologist of the U.S. Eclipse Expedition of 1860), so called after Domino Harbour on the east

coast, lies in a depression in the Laurentian rocks about 125 miles long by 25 broad, between Domino Harbour and Cape Webuc or Harrison. Its greatest development is in the neighbourhood of the former place. Here, according to Mr. Lieber, it consists of light-coloured, slightly schistose gneiss, from a fine-grained to a conglomerate character, the latter being due to the presence of small pieces of quartz, which is often green. It also holds large masses of white quartz. The rock being soft and becoming denuded under the weather, leaves these masses projecting from the surface. In the vicinity of Domino Harbour it forms "a low, flat plain about 10 miles broad and 15 to 20 miles long, through which rise bosses of trap. Its surface is but a few feet above the level of the sea . . . with patches of white rock (quartz?) glistening in the sun." (Packard's *The Labrador Coast*, p. 287.) The rocks just described appear to be Huronian rather than Laurentian in character, and they may be provisionally placed with the former.

Cambrian System.—Lakes Mistassini and Mistassinis (Little Mistassini) lie in a very ancient geographical depression, remarkable for containing an isolated area of unaltered but also unfossiliferous rocks, which are considered to be of Cambrian age. These lakes are close together and parallel to each other, and they rest wholly within this Cambrian basin, although the central portion of the north-west shore of Lake Mistassini for some distance corresponds exactly with the geographical boundary in that part. The strike is parallel to the length of the lakes, and the basin extends for six miles south-west of the southern extremity of the larger one and to an unknown distance to the north-east of it, and has a width in the central part of 26 miles. The rocks of this basin consist of grey and bluish-grey limestones and dolomites, some beds of which contain cherty concretions while a few are arenaceous. There is also a little black shale, and at the top of the series a layer of conglomerate made up of limestone pebbles in a sandy matrix. The dips are low, varying from 4° to 15° and in one place 20°. The portion of the series that can be measured does not exceed 100 feet, but the absolute thickness may be greater.

The long recess in the western coast between Cape Jones and Cape Dufferin is lined all round with a fringe of long narrow islands near and parallel to the coast. They consist of Cambrian rocks, all dipping westward into Hudson Bay. The main shore from Great Whale river nearly to the Nastapoka is formed of rocks belonging to the same system, and they likewise dip into the sea. Their total thickness must amount to thousands of feet. They consist of red and grey sandstones and conglomerates, bedded grey quartzites and hard sandstones, black shales, argillites, with layers of red jasper and hematite, calcareous cherty beds sometimes brecciated, blue and bluish-grey limestones and dolomites, some of them holding cherty nodules and others arenaceous, amygdaloids, greenstones, and quartz-porphyries. The angles of dip are very moderate, seldom exceeding 5°. The glaciation having been westward, or against the edges of the strata, the escarpments both of the mainland and the islands all face eastward or inland.



From Photograph by Jas. L. Cotter.

HILLS ON SOUTH SIDE OF LITTLE WHALE RIVER, LOOKING SOUTH-EAST.

These rocks, both in their assemblage and in the characters of their various members, bear a close resemblance to the Animikie and Nipigon series of Lake Superior, and they are all considered to be of Cambrian age. In my (Geological Survey) Report for 1877, I called the series, for convenience, the Manitounuck groups. In some places these rocks are seen to rest unconformably upon the Laurentian gneiss, while in others, as Little Whale river and Richmond gulf, they lie, also uncomformably, upon a hard, coarse, thick-bedded or unstratified reddish conglomerate, which I have called the *Intermediate Formation.*

On the Kaniapiskow and its continuation, South river, Mr. Low in 1893 came upon a great belt of rocks like those which have just been described on the west coast. The stream flows upon them for about 120 miles, or nearly to Fort Chimo. Their general strike is NNW., and the dip is to the north-eastward, at angles varying from almost nothing to 40°. The following year the same gentleman found a wide belt of similar rocks, also striking NNW., around Lake Petitsikapow at the great elbow of Hamilton river. Their character, position, and strike render it highly probably that they are a continuation of the great belt of South river. Assuming this to be the case, and that the belt continues no farther north than Leaf river, it would have a length of 350 miles and a breadth of some 35 miles.

On the west side of Ungava Bay, between Leaf river and Bay of Hope's Advance, Mr. Peter M'Kenzie of the Hudson's Bay Company informed me that the coast and its many adjacent islands consisted in part, at least, of sandstones. These may represent a continuation of the Cambrian belt. On the other hand, owing to the general eastward dip of this belt, its sandstones, which are at the base, would be on the western and not the eastern side. The unaltered or bedded rocks of the whole western side of Ungava Bay and Akpatok Island are provisionally coloured as Silurian on the accompanying map, for reasons to be mentioned further on. In 1890, Mr. P. M'Kenzie, then resident at Sudbury, gave me a general account of the Cambrian rocks of South river, of which we have now a good description from Mr. Low. The latter found them to consist, in ascending order, of hard, grey sandstone, containing grains of felspar, red sandstone and red and green argillite; a considerable thickness of red, green, and dark shales, passing into an iron-bearing series holding beds of hematite, which, in some places, are about 100 feet thick, with fragments of red jasper scattered through the ore; 1000 feet or more of bluish and grey limestones, partly magnesian and partly siliceous, with which are associated bands of spathic or clay ironstone, probably manganiferous, and also some cherty layers. Some of the green and black shales hold much iron pyrites, and their surfaces become rusty under the weather. Cherty rocks form the highest stratified members of the series, but flows of greenstone, 100 feet or more in thickness, cap many of the hills along the river. As a rule, the angle of dip is low, and consequently the hills have long slopes to the north-eastward, with steep faces to the south-westward. Notwithstanding the regularity of the dip, Mr. Low thinks it would not be safe to base any calculation of the thickness upon this fact, since the series may be

faulted by longitudinal upthrusts and partially repeated in various parts.

Michikamow lake lies in an ancient geographical basin, which appears to be still floored with the lower members of the Labrador Cambrian series, consisting here of red sandstones and shales, which show themselves in patches above the level of the water.

Another proof that Lake Melville likewise occupies a very ancient depression is the fact that the lower portion of the Cambrian series occurs along its northern side. Again, there is a small patch of these rocks in the bottom of the valley of Hamilton river a short distance up. The thick horizontal flows of greenstone at Château Bay, opposite Belle Isle, and the flat-lying beds of hard, coarse sandstone on the north-west side of the straits of the same name, are also considered to be Cambrian.

Silurian System.—Mansfield Island, lying to the west of Cape Wolstenholme, is formed of horizontal beds of grey limestone, which, from the fossils I collected there in 1884, proved to be of about the age of the Niagara formation. Akpatok Island, in Ungava Bay, consists of thinly stratified rocks, supposed to be Silurian. The Laurentian chain of mountains which runs from Cape Wolstenholme along the south side of Hudson Strait ends at Cape Hope's Advance, and from thence to the bay of the same name the whole country is low and flat, being probably underlaid by Silurian rocks; and there is some reason to believe that they extend westward along the depression to Mosquito Bay, on the north side of which there is said to be a long cliff of rocks lying in horizontal layers. The drift on the lower levels in M'Lellan Strait, near Cape Chidley, contains many angular fragments of limestone and shale holding Silurian fossils, and it is believed that these came from the western side of Ungava Bay during the later stages of glaciation.

Surface Geology.—It has been pretty well proved by the geological investigations which have been already made in and around Labrador, that the whole peninsula has been glaciated, with the exception of the higher parts of the mountain range of the Atlantic coast. The direction of the grooving or striation in numerous parts of the country is shown by red arrows on the accompanying map. From these, it is evident that the tendency of the ancient glacier which covered the country was to move from the highest levels outward or towards the sea on all sides. Along the southern and western coasts, the rounding and planing down of the rocks is well marked, showing that the action of the ice has been long continued or intense. But on the Atlantic coast the glacial striæ are very light, and they are to be found only on the lower levels or in valleys, down which they run directly towards the ocean. The course of the ice grooves has not been noted anywhere in the interior of the northern division of Labrador, but along the north slope of the mountain chain overlooking the south side of Hudson Strait they all run eastward. The same course is maintained everywhere on the north shore of the Strait. The "stoss" or rounded ends of glaciated ridges on both sides is always towards the west, showing that during the glacial epoch a

From Photograph by Dr. Bell.

FORD'S HARBOUR, NEAR NAIN.

great ice-stream passed down this channel into the Atlantic. The composition of the drift on the shores of the Strait also proves this movement, its materials at any point having come from the westward. General conditions, both during the glacial epoch and at the present day, would also show that this must have been the direction of the movement in the valley now occupied by the Strait, since the course of glaciers has always been from the continent towards the ocean and not *vice versâ*.

The islands, near the east side of Hudson Bay, which Captain Gordon and I named the Ottawa group, in latitude 59° 45′, longitude 80°, are well glaciated on their lower levels. The direction of the striæ varies somewhat in different parts, but the general trend of the movement of the ancient glacier here was evidently northward. There can be little doubt that the basin of Hudson Bay was dry land during the glacial epoch; and it is probable that part of the ice which then lay upon its bed moved northward to join another stream from Fox Channel, and that the united glacier then passed down the great valley now occupied by Hudson Strait. The very high and bold land at Cape Wolstenholme seems to have acted as a *pièce de resistance* against the ice-stream from Hudson Bay. On Outer Digges Island, off the Cape, which is also moderately high, the striation and the forms of the glaciated buttresses show that the ice here moved north-eastward, round the corner, as it were, or that its course here changed from north to east.

The abundance of boulders is one of the characteristics of Labrador. The surface of the country is nearly everywhere encumbered with them. They are scattered about promiscuously and are of all sizes, or they form ridges and piles in all kinds of situations. They may be observed perched singly or in groups on the sides and tops of hills where it would seem very easy to dislodge them, showing that no severe earthquake shocks have occurred in Labrador since the glacier melted away and gently deposited these boulders in their present situations. Large rounded blocks are often seen supported by smaller ones, so as to leave a clear air-space beneath them.

In the centre of the peninsula, Mr. Low says the boulders or loose masses of rock and also the smaller fragments are mostly angular and not far-travelled, which would help to prove that this was the region of nevé, from which the ice started in different directions, as indicated by the striæ. He observed hills of drift and morainic ridges in many parts. The latter were often pitted with large holes or hollows like the "kettle moraines" of the United States geologists, these depressions having been left by the melting away of large masses of ice which had been incorporated with the more lasting materials at the time the ridges were formed by glaciers. Mr. Low also detected long low ridges of finer and further transported drift material, like the osars of Scandinavia.

Raised beaches occur along all the coasts of Labrador, and afford very striking evidence to even the most casual observer of the elevation of the land. On the lower levels the evidence is so fresh that this elevation must have taken place within a very recent geological period, and it appears to be still going on. On the west, or Hudson Bay coast, long

lines of drift-wood are found up to 30 feet, or more, above high-tide mark, and deep-water deposits, containing fresh-looking shells, have been raised above the present level of the sea; while shallow-water deposits, with their characteristic shells, are frequently met with at higher levels. Fish traps constructed of stones, and other shore works of bygone generations of Eskimo, are now raised high above the sea-level. The numerous terraces overlooking the bay preserve their steep faces, and the smooth gravel and shingle of which they are formed is still bare and almost as fresh-looking as that of the present shore.

Similar conditions exist on the northern and eastern coasts. In regard to an ancient beach, 200 feet above the sea in Indian Harbour, off Hamilton Inlet, Packard says: "Its shingly surface was free from vegetation and it looked as though the waves had receded from it but the night before" (*The Labrador Coast*, p. 170). In an uplifted sea bottom, forming the present beach at Hopedale, Packard found the stones and pebbles "covered with nullipores and polyzoa; the *Mya truncata* still remains perpendicular in its holes, and the most delicate shells, with their epidermis still on, are unbroken, and their valves often united by the ligament. . . . It is evident that this deposit has slowly and almost imperceptably risen some 400 or 500 feet, without any paroxysmal movement of the continent, over an extent of coast some 600 miles in length." (*Ibid.*, p. 324.) Between Belle Isle and Hopedale the same traveller noticed raised beaches in upwards of 75 different places. They make about 12 terrace-levels, ranging up to 500 feet, but most of them are under 200 feet.

Farther north, raised beaches occur at much higher levels. Some seen at Nachvak Inlet I estimated to be about 1500 feet above the sea. I also found high shore-lines on Marble Island in the north-western part of Hudson Bay, and similar lines, at great heights, have been observed by others in Roe's Welcome and on the land still farther north. M'Lean says: "Along certain parts of the (east) coast of Labrador rows of boulders are perceived, lying in horizontal lines, the lower about 200 yards distant from high-water mark, while the farthest extend to near the crest of the adjacent hills."

Professor J. W. Spencer has found by the actual levelling of ancient beaches over long distances in the province of Ontario and the State of New York, that there is a differential elevation of the land towards the north-east amounting to from one to three feet in a mile. If the amount were even much less, and it extended into the Labrador peninsula, we should there expect to find very high beaches.

Economic Minerals.—The upper beds on nearly all of the long islands near the east coast of Hudson Bay, between Little Whale and Nastapoka rivers, consist of a rich manganiferous spathic iron-ore. The islands are destitute of trees, and their long gentle slopes to the sea expose millions of tons of the ore, which could be broken up and shipped at small cost. The quantity is practically inexhaustible. The thick beds of hematite which Mr. Low saw in the Cambrian rocks along South river exposed millions of tons of ore close to the stream and more in the

hillsides. Similar ore in abundance accompanies these rocks in the southern extension of this band around Petitsikapow lake.

Copper ore is reported to occur in different places on the Atlantic coast, but no definite or reliable information is available regarding their deposits. I have received good specimens of copper pyrites from Indian Island off the entrance of Hamilton Inlet.

Galena occurs as small and large segregations, often weighing nearly one hundred pounds and apparently in workable quantities, in a twenty-feet bed of limestone in the Manitounuck (Cambrian) rocks at Little Whale river and Richmond gulf and, probably, in the same bed all the way between these localities. It contains scarcely enough silver to be worth extracting.

Gold was found in traces on assaying samples of quartz from veins at Nachvak, Cape Chidley, and one of the Ottawa Islands. In various places on the Atlantic coast the schistose and granitoid rocks contain large isolated masses of quartz. Those in the "Domino quartzites" have been already referred to. They would be worth assaying for gold, for should they be found to contain even a few pennyweights to the ton, it would pay to work them in such an accessible region.

Among the ornamental stones of the peninsula the different forms of labradorite are the best known. A massive variety with iridescent spots occurs at Hamilton Inlet. The Eskimo mine the precious kind on Paul Island, and the mineral is sent from Nain by the missionary ships. It exhibits a number of beautiful colours, including dark and light blues and greens, red, fire-colour, steel-grey, etc. Mr. Low found fine specimens of this mineral at Michikamow lake. Amazon-stone and fine paulite occur at Port Manvers. On the western side, the amygdaloids of the coast about Richmond Gulf are full of agates and cornelians, and on an island near Great Whale river a fine variety of translucent green quartz is found in small veins.

Various other minerals and rocks are found in Labrador which would be of value in a more thickly-inhabited country. Among them may be mentioned the excellent building stones which abound among the Cambrian rocks of the west coast and the flagstones of Ramah on the east. The Eskimo of Cape Wolstenholme bring good whetstones in the form of long splinters which are easily smoothed into shape. On South river, a little above the Forks, Mr. Low found among the Cambrian rocks a compact white siliceous stone which appears to be identical with the novaculite of Washita in Arkansas, so highly prized for hones.

Anthracite of excellent quality is found on Long Island, off Cape Jones, but it appears to have resulted from the alteration of a mineral like albertite, and occurs in veins in the Cambrian rocks of the island. Mr. Low found a vein of a similar mineral near the southern extremity of the great belt of Cambrian rocks of the interior.

Climate.—It would not be possible in the limits of this paper to give a satisfactory account of the climate of a country so extensive as Labrador. While the southern extremity is temperate and pleasant, the northern part borders on the Arctic. Owing to the influence of the sea,

the cold around the coasts is not so intense as in the inhabited portions of our North-west Territory, but as the winter is longer, ice forms to a greater thickness, amounting to seven feet at Hamilton river, according to Mr. Low. The snow is moderately deep in winter, and there are copious rains in the spring and summer. The forests form a better index of the climate than columns of meteorological statistics. Although it must be confessed that the country as a whole is poor both as to climate and soil, yet it is not so forbidding as has been represented. Professor H. Y. Hind in his work on Labrador, published in 1863, says: "Language fails to paint the awful desolation of the table-land of the Labrador peninsula." On the other hand, Mr. Low, who returned in 1894 from a two years' exploration of the interior, says: "These explorations will give a good idea of the physical aspect and climate of the interior, about which very little was previously known by the public, and will correct the popular idea that the Labrador peninsula is a waste, barren region, totally unfit for habitation." (*Summary Report of the Geological Survey for* 1894, p. 80.) Professor Hind saw but little of the interior.

Forests.—The Labrador peninsula, as a whole, may be said to be more or less clothed with forest, with the exception of a small area in the north-western extremity and another along the northern part of the Atlantic coast, which may be called barren grounds like those north of the forests on the west side of Hudson Bay. Mr. Low says that, in a general way, the country northward to latitude 54° is pretty well covered by continuous forest, except on the hill-tops in certain districts. Northward of this latitude its continuity is broken by treeless spots and patches of greater or less extent, and the timber is found principally in the valleys and lowlands. The accompanying map shows the northern limits and the peculiarities of distribution of the prevailing kinds. These lines may in the future require to be somewhat modified in regard to details, but for the present they can be taken as approximately correct. They are laid down from information derived from all the sources mentioned in previous pages, the latest being Mr. Low's report. If we take any point on the map, it is to be assumed that all the trees whose boundaries lie to the northward of it are to be found in the vicinity of such a point, except the balsam, poplar, and Banksian pine, whose limits describe unusual curves.

Within the boundaries of the peninsula, as given in the beginning of this article, at least twenty-four different kinds of forest trees are to be found, which is about as many as are native to all Europe. Whether we consider their extent or the variety of the trees, it will therefore be seen that the forests of Labrador are not to be despised. A certain number of the species, however, grow only in the southern part, and a few of them are confined to a small area, even there; still there is a considerable diversity in the trees of the greater portion of the peninsula. The white spruce (*Picea alba*), black spruce (*P. nigra*), and larch or tamarack (*Larix Americana*), are the most plentiful and most generally diffused of the conifers. These three trees are about equally northern in their range, which extends

From Photograph by Dr. Bell.

NACHVAK INLET (SOUTH SIDE), NEAR ENTRANCE.

considerably beyond that of any other species. The limit of the balsam fir (*Abies balsamea*) is considerably farther south, but still the tree is found throughout more than two-thirds of Labrador. Banksian pine (*Pinus Banksiana*) grows as far north as Great Whale river, but it avoids the East Main coast, and its limit appears to curve southward before reaching Michikamow lake. Its southern line on the north side of the St. Lawrence keeps a short distance back from the river all along, and it seems to shun the salt water. The northern limit of white pine (*P. strobus*) extends east about as far as Mingan. It is an abundant and valuable tree in Newfoundland. Red pine (*P. resinosa*) occupies only a small area north of the Saguenay. The north line of the white cedar (*Thuya occidentalis*) runs from Rupert's House to the vicinity of Pointe des Monts. It is a remarkable fact that this tree, though large and fine in Gaspé and New Brunswick, is absent from Anticosti, Newfoundland, Nova Scotia (except a small part adjacent to New Brunswick), and the eastern part of Prince Edward Island. Although no person appears to have observed the balsam poplar (*Populus balsamifera*) in the large area in the centre of Labrador, indicated on the map, it cannot be asserted that it does not exist there. On the west side of Hudson Bay, this is the most northern deciduous tree. The large-toothed poplar (*P. grandidentata*) is found only in the south of Labrador, while the aspen (*P. tremuloides*) ranges far north. The bird cherry (*Prunus Pennsylvanica*) has nearly the same range as the latter. The northern limit of the canoe birch (*Betula papyrifera*) reaches the forks of the Ungava river, which may be a little beyond the known limit of the balsam poplar. In many of the valleys it attains a sufficient size for its bark to be used in building canoes. Black alder (*Alnus incana*) and black willow (*Salix nigra*) have a wide range in the southern half of the peninsula. The yellow birch (*Betula lutea*), mountain ash or American rowan (*Pirus Americana*), black ash (*Fraxinus sambucifolia*), sugar maple (*Acer saccharinum*), red or soft maple (*A. rubrum*), and mountain maple (*A. spicatum*), are all confined to small areas in the south. White or grey elm (*Ulmus Americana*), basswood or linden (*Tilia Americana*), and red oak (*Quercus rubra*) are found around Lake St. John, where the soil and climate are exceptionally favourable. The following trees flourish in the valley of the St. Lawrence, close to the southern point of the Labrador peninsula as above defined, namely, hemlock (*Isuga Canadensis*), ironwood (*Ostrya Virginica*), American beech (*Fagus ferruginea*), white ash (*Fraxinus Americana*), blue beech (*Carpinus Caroliana*) and scarlet-fruited thorn (*Crataegus coccinea*). Among the numerous kinds of shrubs growing in Labrador, the rowan bush (*Pirus sambucifolia*), whose northern limit is marked on the map, deserves mention, as its berries constitute the food on which the marten depends when rabbits and other animals are not to be had. The fur of the marten is one of the most valuable productions of Labrador.

No timber is yet exported from Labrador. The larger trees in the southern parts are fit to be sawn into lumber; but the wood of the country in general will be valuable in future only for such purposes as making paper pulp, railway ties, telegraph poles, small spars, fencing, house-building, timbering mines, firewood, making charcoal, etc. The trees

seldom reach two feet in diameter, and are generally less than one foot. Their size appears to depend more on soil and shelter than on the latitude, for some of the finest forests are to be found in the northern parts. In reference to Erlandson lake, in latitude 57°, Mr. M'Lean says: "The circumjacent country is remarkably well wooded, even to the tops of the highest hills." Leaving this lake and journeying southward, he says: "Passed over several small lakes; the country well wooded. Entered upon a small river about noon; the banks covered with large pine." (White spruce is called "pine" by the Hudson's Bay Company's people.) In the thirty-four miles of his route southward from Erlandson lake, when he reached Whale river (of Ungava Bay), he says: "The face of the country presents scarcely any variety; from Erlandson lake to this river it is generally well wooded, but afterwards (southward) becomes extremely barren—nothing to be seen on both sides of the river but bare rocks." Further on he passed through a good deal of wooded country to the height of land. Mr. Low noticed that on the lower part of South river near the Forks, the black spruce, larch, and white birch were all larger than higher up the stream. He says that, on the Cambrian belt of rocks, in the vicinity of Lake Petitsikapow, "there is also a marked improvement in the size of the trees due to a richer soil covering this area; and along the river and in the valleys, white, black, and balsam spruce are frequently met with, over twenty-four inches in diameter three feet from the ground. White birch also grows larger and more abundantly than elsewhere." (*Summary Report of the Geological Survey for* 1894, p. 77.) Forest fires every year destroy much timber in the interior of Labrador, as elsewhere in northern Canada. The process appears to have been going on from time immemorial, and young trees are constantly growing up to replace those destroyed, so that "second growths" of all ages are to be met with at intervals throughout the country.

Fauna.—The sea around the whole coast of Labrador is well stocked with numerous species of cetaceans and seals. The walrus in large numbers inhabits all the northern parts of the coast and adjacent islands. Among the land mammals nearly all the fur-bearing animals of eastern North America are more or less plentifully represented. The beaver is scarce, perhaps on account of the great thickness of the ice on the lakes in winter. Beyond the edge of the forest the principal fur-bearing animals are the red fox and its varieties, the cross and silver or black, the white and the blue fox, the wolf, the wolverine, the polar bear and the grizzly. The last named has also been called the "barren-ground bear" and possesses much interest for the zoologist. Of him M'Lean says: "When we consider the great extent of country that intervenes between Ungava and the plains of the far west, it seems quite inexplicable that the grizzly should be found in so isolated a situation and not in the intermediate country. The fact of their being here, however, does not admit of a doubt, for I have traded and sent to England several of their skins." Captain Kennedy, who was in charge of the Ungava for many years, informed me that he had collected many skins of this animal in the district. Can his presence here be connected with the fact that the elevated Labrador coast

range continues northward to high latitudes along the west side of Davis Strait, Baffin Bay, and the lands thence northward as far as explorers have gone?

The moose and the woodland caribou are occasionally seen in the south-western part of the peninsula, and the reindeer, or barren-ground caribou, is abundant in the north. These animals appear to migrate annually in a wide circle. Starting late in summer for the west coast, they follow the verge of the forest eastward, cross the Ungava river in September and October, and on reaching the Atlantic coast turn southward and then westward, through the woods, in the winter, to their original starting-place. Others cross and recross the Ungava river in the month of March. Mr. Peck states that along the Natwakame river the reindeer have beaten wide trails parallel to the banks of the stream, which his men found very convenient to use as portage roads past the rapids. In the month of August 1877 these animals were numerous near the coast to the north of Little Whale river and the Eskimo were shooting them with their bows and arrows. During summer the Eskimo kill many reindeer in the northern division of the peninsula, especially near Hudson Strait, to the west of Cape Hope's Advance. Deer of all kinds have become exterminated throughout the southern water-shed of the peninsula, principally through the improvidence of the Indians.

According to Mr. Lucien Turner, who has studied the subject for the Smithsonian Institution, 209 species of birds have been noted as occurring in Labrador. With the exception of the two species of ptarmigan, game birds are not plentiful. This is especially the case with the aquatic birds, and the fact is due to the scarcity of their food.

The staple sea fishes of the Atlantic coast are the cod and herring. The haddock does not appear to extend north of Belle Isle. Capeling, the great food of the cod, are on all the coasts. I picked up a flatfish in Hudson Strait which I took to be a young halibut. The question of the existence, or otherwise, of the common cod in Hudson Bay is one involving millions of dollars, and it remains unsettled up to the present time. I have seen and eaten rock cod, several pounds in weight, taken in nets on the east side of James Bay, and since the conditions are favourable for their propagation, it is reasonable to suppose that the ordinary cod can also breed in Hudson Bay, where all the requirements of his existence appear to exist. The common salmon (*Salmo salar*) is found in all the larger streams from the Saguenay to Hudson Strait, and is particularly abundant in the rivers of Ungava Bay. Hearne's salmon (*S. Hearnii*) is caught in the rivers of the Strait and on both sides of Hudson Bay, and sea-trout in the mouths of all the rivers around the entire coast-line. The win-iwish, or "land-locked salmon," inhabits Lake St. John and all the lakes connected with Hamilton river as far as known. The large lake whitefish abounds in nearly all the inland waters, and is also caught in salt water on the east side of James Bay. Speckled trout are abundant in all the streams and lakes. A large species of sturgeon, which is common in the lakes and rivers of the drift-covered country on the west side of Hudson Bay, is also found in the lower parts of the streams on the east side of James Bay within the area marked on the map as being mostly under 600 feet

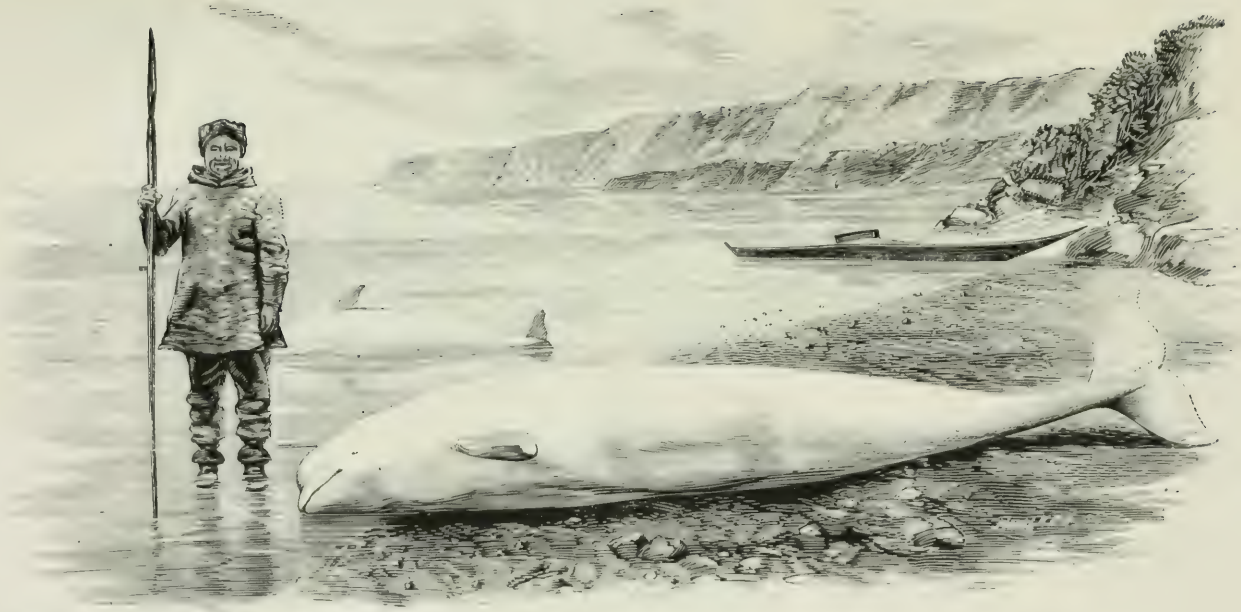
above sea-level. The other fresh-water fishes comprise the herring-whitefish, the mari, dog-fish or ling, pike, pike-perch, and suckers of different species.

Population.—The figures in the table below are derived from the following sources. The resident white population of the Atlantic coast, from Blanc Sablon northward, is from the Newfoundland Government census of 1891, and there has been little change since that time. Both the white and Indian populations from Blanc Sablon to the west end of Lake St. John are from the Dominion Government census of 1891, and there may have been some increase in the number of whites, but this is uncertain. The remainder of the Indian population is a good approximation to the number at present trading at the different posts of the Hudson Bay Company. Previous estimates have greatly overstated the numbers of the Indians of the interior. The Eskimo begin to be met with in straggling numbers at Hamilton Inlet, and they extend up the Atlantic coast, along Hudson Strait, and down the west coast as far as Cape Jones. The figure given for the coasts from Cape Chidley to Cape Jones was found by adding together my own estimates of the numbers at all their different settlements and camps, and it may, perhaps, be slightly under the mark. Some of these people hunt the reindeer at certain seasons a short distance inland on the barren grounds, but they all come to the coast as their homes. In 1860 there were 1400 Eskimo belonging to all the Moravian settlements, and the numbers have remained almost stationary. The Secretary of the Moravian Missions in Labrador, referring to 1887, wrote to Dr. Packard: "We reckon that there are less than 1500 Eskimo on the strip of coast from Hamilton Inlet to Ungava."

Population of the Labrador Peninsula.

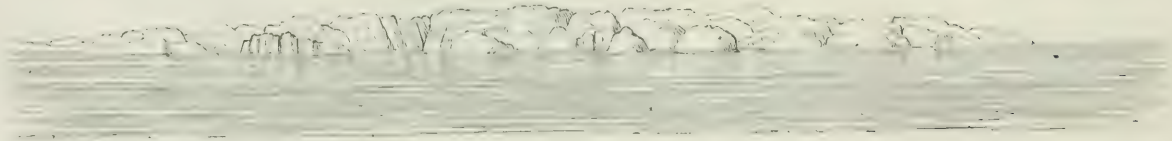
		Numbers.
Atlantic coast from Blanc Sablon to Cape Chidley—Whites		4,100
North shore of St. Lawrence from Blanc Sablon to Tadousac in 1891—Whites		7,915
Ditto—Indians		1,387
On north side of Saguenay and Lake St. John—Whites		1,324
Ditto—Indians		434
On east coast of Hudson Bay—Whites		40
Indians trading at Hamilton Inlet	125	
Ditto at Davis Inlet (Naskopies)	230	
Ditto at Fort Chimo (Naskopies)	90	
Ditto at Nitchiquan, Mistassini, and Waswanipi (all Montagnais)	230	
Crees and Montagnais trading at Rupert's House	250	
Ditto trading at other ports on east side of Hudson Bay	270	
		1,195
Eskimo at and between Moravian settlements on Atlantic coast		1,400
Ditto, thence northward to Cape Chidley		50
Ditto from Cape Chidley to Cape Jones		650
		18,495

Total white population (resident), 13,379; Indian, 3016; Eskimo, 2100. Taking the area of the peninsula at 560,000 square miles this would only



From Photograph by Jas. L. Cotter.

ESKIMO AND LITTLE WHITE WHALE (*Delphinapterus catodon*), MOUTH OF GREAT WHALE RIVER.



From Sketch by Dr. Bell.

CAPE WOLSTENHOLME, SOUTH SIDE OF HUDSON STRAIT, OVER 1000 FEET HIGH.

give one inhabitant to each 30 square miles of territory. It is estimated that at least 1000 schooners, mostly from Newfoundland, proceed to the Atlantic coast of Labrador every summer to fish. Many of these carry several families, but at the rate of only ten persons to each schooner this would give a floating population of 10,000 during three months of each year. In addition to these a considerable number of tourists from the United States and elsewhere visit the coast every summer.

Moravian Missions.—The Unity of Moravian Brethren, or Unitas Fratrum, has six stations on the Atlantic Coast of Labrador for the benefit of the Eskimo. They are situated in the following order from south to north:—

Station.	Founded.	Number of Eskimo in 1886.
Hopedale	1782	160
Zoar	1865	90
Nain	1771	214
Okkak	1776	308
Hebron	1830	207
Ramah	1871	71
		1050

The late Rev. B. La Trobe, secretary in London of the Moravian Missions, said that there were in 1886 less than 1500 Eskimo on the whole coast. If we allow 350 for those residing at various places between the mission stations, and 50 for those between Ramah and Cape Chidley, the whole number becomes 1450, which is not far from correct for the present year (1895), as the numbers appear to have remained about stationary for a long time. These people have improved very much in their moral and spiritual character under the influence of the devoted missionaries, although their self-reliance and physical stamina are not equal to those of the heathen Eskimo of Hudson Strait. The Moravians endeavour to make the missions self-supporting as far as possible, and for this end they encourage the Eskimo to hunt foxes and other fur-bearing animals, for which purpose they lend them traps and supply ammunition, and then pay them fair prices for their returns. The mission ship, of which successive ones have been called the *Harmony*, visits the stations each summer for the purpose of bringing the outfits and taking back the produce of the year's trade. The natives speak German, and appear to be fond of their religious exercises, especially the singing. In 1893 some enterprising Americans transported upwards of fifty of them, including men, women, and children, from Nain to Chicago, where they remained during the Columbian Exhibition. On their return, these simple children of nature would doubtless have endless stories to tell to their wondering relations.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The Franklin Commemoration.

On June 4th the Society's rooms in Edinburgh were filled by a large number of the members of the Society and their friends, assembled to celebrate the sailing of Sir John Franklin on his memorable voyage for the discovery of the North-West Passage. The proceedings were opened by the Marquis of Lothian, President of the Society, who, in allusion to the event which the meeting was held to commemorate, remarked that it was only right that the fiftieth anniversary should be celebrated by the Society, as the last British land touched at by the *Erebus* and *Terror* was Stromness in Orkney, and the last persons to see the explorers alive were the crew of a Dundee whaler. Dr. Dalgleish was to read a paper on the work of Sir John Franklin, and he (the Marquis) thought a few words on pioneer Arctic expeditions would form an appropriate introduction. Beginning with the discovery by the Scandinavians of Iceland in 861, and Greenland towards the close of the tenth century, the Marquis brought the narrative down to the beginning of the sixteenth century, when England seriously took up the work of finding a North-West or North-East Passage in order to reach India and participate in its supposed exhaustless wealth. This done, the work from Frobisher and Sir Humphrey Gilbert to Parry and Ross was reviewed. The Marquis next spoke of the Franklin search expeditions, and said it was impossible to overestimate the services which Sir John Franklin had rendered both directly and indirectly to the cause of geographical discovery. Besides the valuable information which he collected personally in his various expeditions, his heroic example had given a stimulus to the spirit of enterprise, particularly in respect of Arctic exploration. Before Franklin undertook his first Polar voyage, as second in command to Captain Buchan, in 1818, but little was known of the Arctic region, and the difficulties and dangers attending all expeditions thither were curiously underrated. Whether or not Franklin shared the light-hearted assurance of his friends at home before his first voyage, there could be no doubt that when he undertook his last he was fully aware by bitter experience of the difficulties which awaited him. His was no ignorant enthusiasm. Though full of hope and confident of ultimate success, there could be no doubt but that he had fully counted the cost, and this it was that made his conduct so heroic, and placed him in the proud position of one of England's most gallant sons. The "touch of nature which makes the whole world kin" was not wanting when one after another the search parties returned to England with no tidings to cheer the weary waiting of that noble, devoted soul, Sir John Franklin's wife. Her untiring zeal and devotion gave impetus, if such were needed, to the exertions of the British Government, which organised no less than eighteen search expeditions during the ten years between 1848 and 1858. The names of many commanders who took part in these expeditions were familiar as "household words," more particularly, perhaps, that of Admiral M'Clintock, who, after two voyages, during which he made valuable geographical discoveries and endured countless hardships, fulfilled the melancholy duty of bringing to England evidence so irrefragable of the sad fate which had overtaken Franklin and his comrades, that even his brave wife, who had hoped against hope through so many weary years, was at last forced to accept the truth. Speaking of recent Arctic work, the noble Marquis specially referred to the service of Nordenskiöld, to Nansen,—for whose safety he expressed a fervent hope—and to

the Jackson-Harmsworth expedition now advancing on the Pole from Franz Josef Land. He thought there could be no reasonable doubt that in course of time all the North Polar area would be mapped out, and that before that was accomplished results of practical as well as of purely scientific value would be attained. In his view, however, the Antarctic Ocean was to be the great field for future discovery, and he hoped that the efforts now being made by scientific and learned societies to impress on the Government the great importance of despatching a fully-equipped expedition to explore this vast *terra incognita* would be successful.

Dr. Scott Dalgleish then read the paper which is published in this number of the *Magazine*, illustrating Sir John Franklin's discoveries by means of a map, of which a reproduction is also given.

Admiral Sir Leopold M'Clintock then rose at the call of the Chairman, and related how perseveringly he and Lieutenant Hobson searched the western and south-western shores of King William Land, a dreary desolate shore then covered with snow, in search of documents. Hobson carefully explored 150 miles of coast, and he afterwards went over it himself with the advantage of the knowledge that had been acquired. The impression which was conveyed to their minds by all they saw—the relics, the skeletons, and such like—was that the most careful preparations had been made for this desperate retreat. The officers must have known perfectly well that it was a desperate undertaking to attempt to reach from the place where they were the Hudson Bay territory, and it was quite beyond their power to do it. They had been three years shut up in a ship; they had endured great hardships and privations; they had suffered from sickness, doubtless from scurvy, for 24 out of 129 had already died, and when they landed they had no craft to carry a number of helpless men. When they landed they took with them as much as they possibly could. They had only three boats for 105 men, but these were on sledges, for the whole fitting out of the retreat was most perfectly done. Still the task was beyond what they could do, and they only got 150 miles. He did not think they could adequately admire the heroic conduct of these men. In the officers the men had trustworthy leaders; in the men the officers had most devoted and faithful followers. They stuck to each other to the end. Of course they discovered the North-West Passage, although they were not able to make use of it or to bring home intelligence of their discovery. Nevertheless, the priority of discovery was due to that expedition. They laid down their lives, that noble band of men and Christians, and they had left an example which was dear to Britons, although they had many more like it in their history. It was these examples of heroism and unflinching courage and perseverance and devotion to duty which were the very life-blood of naval and maritime adventure, and had made Britain what it was at this moment. They honoured these noble men, who proved themselves worthy of the country that sent them out and of their veteran leader, Sir John Franklin, most valiant officer and God-fearing seaman, as were most of the Arctic worthies from the time of the men of the Elizabethan period downwards. He thought it was fitting that they should express their appreciation of the sympathy and generous help which their American cousins extended to them throughout the whole of that Franklin search. He thought they should not forget either, that when the country drew back, and perhaps rightly drew back—having sent out many search expeditions—Lady Franklin, whose resources were almost exhausted, still persevered. She appealed to the country, and the widow's prayers and the widow's appeals and the widow's mite prevailed; and so they had the records in the exhibition in the next room.

The next speaker was Dr. Murray, who made a strong appeal for Antarctic exploration. He also spoke of Nansen, and expressed his opinion that the explorer

was now within 100 miles of the Pole. He thought no anxiety need be felt on Nansen's account before October 1896.

Professor Copeland made a few remarks on the Austrian explorer Payer, with whom he had been associated in an expedition to the east coast of Greenland.

A vote of thanks to Admiral M'Clintock for his presence was proposed by the Marquis of Lothian, and the Marquis was thanked for presiding, on the motion of Sir Thomas Clark.

The company then passed into the library to inspect the interesting collection of Franklin relics and objects connected with other Polar voyagers, both Arctic and Antarctic, which had been lent by various institutions and private contributors. The exhibition was open daily during the remainder of the week, and proved a great attraction to many hundreds of visitors. A list of the exhibits will be published in the next number of the *Magazine*.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

The Ægean Sea.—A few details of the explorations of the *Pola* in this sea were given in vol. x. p. 319. Since last year the reports have been published, and Dr. Gerhard Schott has compiled an account of the results of the expedition, accompanied by a chart of depths and charts of salinity and temperature, for *Globus* (Bd. lxvii. No. 20). The Ægean is a shallow sea, the depths of 1000 mètres (547 fathoms) being found over small areas, while depths of 2000 mètres (1094 fathoms) occur only in two small patches to the north of Crete. The sea is bounded to the south by a line running from Cape Malea through Cerigo, Cerigotto, Crete, Karpathos, and Rhodes to the coast of Asia Minor, 400 miles in length, of which only 100 nautical miles are sea. The broadest channel connecting the sea with the Mediterranean is that lying between Crete and Kasos, which is 26 nautical miles broad, with a maximum depth of 430 fathoms. The same depth is found between Crete and Cerigotto, while the channels north and south of Rhodes have 219 fathoms, and that between Cerigo and Cerigotto only 88. In the north there is only one channel, the Dardanelles, with a breadth of 2 nautical miles and a depth of 55 fathoms.

The sea is divided into several distinct basins of different areas and depths, of which there are three principal, divided from one another by ridges running across from Asia Minor to Greece. The most southern is bounded by Crete and Karpathos on the south and the Cyclades on the north. Here the maximum depth of 1230 fathoms was sounded, 15 nautical miles north of Cape Sidero, the eastern extremity of Crete. Then we come to the first great ridge, on which stand the Cyclades and Sporades, where the depths over more than half the area do not exceed 110 fathoms. The middle basin lies where the Ægean sea is most contracted, between $37\frac{1}{2}^\circ$ and $38\frac{1}{2}^\circ$ N. lat., and is surrounded by Eubœa, Andros, Samos, Chios, and Scyros. Its depth usually varies from 330 to 440 fathoms, a deep hole between Chios and Samos sinking to 690 fathoms. The second ridge, much narrower in the west than the east, starts from the peninsula occupied by Mt. Pelion, and on it rest the Northern Sporades, the island of Scyros, and the Brooker and Stokes banks, besides the waters of Mitylene and the broad shallow

sea to the south-west of the Dardanelles. This area is less than 110 fathoms deep. The third basin extends from west-south-west to east-north-east, between the ridge just described and the coast of Turkey in Europe, reaching to the Gulf of Saros on the one hand, and to the Northern Sporades on the other. Over a great part of it the sounding-lead sank to about 550 fathoms. The bays between the three peninsulas of Chalcidice are about 270 fathoms deep, while the Gulf of Saloniki and the sea round Thasos and Samothrace are less than 110 fathoms in depth. On the Greek coast the bottom sinks rapidly, whereas the Asiatic coast is bordered by extensive shallows extending to the islands of Lemnos, Mitylene, Chios, and Cos. Were the surface of the water to sink 275 fathoms, the ridges above described would become dry land and the three basins would be cut off from one another.

When the water is at its highest temperature, about the end of August, tropical heat prevails—77° F. and more—especially to the north of Crete and east of Rhodes. At this time the water temperature never sinks below 68°, even in the north. In the open sea the temperature is slightly lower than off the coast. Thus the course of the isotherms is determined less by latitude than by geographical conditions—more or less isolation from the open sea, the number and size of the islands, etc. As a rule the eastern side of the Ægean is warmer than the western. The *Pola* expedition took place in the latter part of the summer, and exact observations of winter temperature are wanting, but from those that have been recorded it may be concluded that the surface temperature lies between 59° and 53° F. As in summer the temperature over the greater part of the sea varies from 77° to 71° F., the yearly range is 18°, which is very little for an enclosed sea, for in the Atlantic ocean at the same latitude the range is 14½, or, perhaps, a little more.

The salinity is 38 to 39 *pro mille*, diminishing in the north to 35 or even 30, where comparatively fresh water flows into the Ægean through the Dardanelles. With regard to vertical distribution, it may be said that down to 35 fathoms the conditions both of temperature and salinity are the same as at the surface, that is, the water is warmer and denser on the Asiatic than on the Grecian coast. It is also singular that even at that depth the effect of latitude does not predominate. At 5½ fathoms the temperature and salinity do not differ much from those of the surface, but at 55 fathoms the temperature is confined within the narrow limits of 53° and 62° and the salinity varies from 38·5 to 39. The ground temperature is regulated rather by the cooling of the surface in winter than by that of the Mediterranean, for in an enclosed basin the water cooled in winter at the surface sinks to the bottom and there remains. It has been stated that the winter temperature of the water is from 59° to 53° F., and the ground temperatures observed are in close correspondence—about 57° in the south and below 55½° in the north.

In summer dry currents of air, of the nature of trade-winds, blows southwards, the area of minimum pressure lying in the direction of the Red Sea. These are the Etesian winds of the ancient Greeks. In winter temporary depressions are frequent, with constant changes of wind. In general, then, a northerly current of air predominates and a high mean velocity of wind. These conditions, combined with the outflow of water from the Black Sea, determine the movement of the water in the Ægean. At the mouth of the Dardanelles the current flows south-westwards with a velocity of five knots an hour. Under the land, however, there is always a back current of which mariners take advantage. Being fresher than the water of the Ægean, this Black Sea water can be traced through the Doro channel, where it runs at 1½ to 2 knots an hour, to Cape Malea, where it sets west-

wards at the rate of two knots or more. Westerly currents prevail also in the waters of Crete and Rhodes, following the general movement of the waters from the Syrian coasts.

ASIA.

Khasia.—On March 14th Mr. C. B. Clarke, F.R.S., President of the Linnean Society, delivered a lecture on Khasia at the Imperial Institute. Khasia has an area of 6000 square miles and a population of 150,000, and forms the central part of the Assamese Government. The country is an open plateau 3000 to 6000 feet above sea-level, and the people call themselves *Nong-phlang*, i.e. "Men of the Grass"; in Bengali they are called *Khasi-loke*, probably meaning the same. The rocks in the northern, and larger, part of Khasia are gneiss, schists, quartzite, and slates of very ancient origin, perhaps pre-Cambrian. They are accompanied by greenstone, granite and granitoid bosses, the latter being of all sizes, from one to fifty feet in diameter, and often forming a prominent feature in the landscape. Little can be said at present about the relative age of these archæan rocks. On the south slope of the country they are overlaid by nearly horizontal fossiliferous beds, of Cretaceous age and later, and a volcanic rock occurs, the Sylhet trap. In several places patches of nummulitic limestone, capped by coal, are left on the surface of the cretaceous limestone. Enormous masses of limestone must have been removed by denudation.

On the southern edge of the hills, at Cherra Punji (altitude 4200 feet), the annual rainfall is 500 inches. Colonel Godwin-Austen once measured 150 inches in five days, and a few years ago 38 inches fell in 24 hours. These heavy falls are local, occurring close to the edge of the plateau; seven miles north of Cherra the fall is 200 inches, and 20 miles still farther north only 85 inches. During the rains the hot air rises saturated from the plain of Sylhet, and as it sweeps over the edge of the escarpment, its temperature is lowered, often as much as 15° F., and therefore much of its water falls over the first four miles of the Khasia plateau.

In Khasia, which has about the same area as Yorkshire, 251 kinds of orchids have been found, a large proportion of them belonging to the most splendid varieties. On the little-known northern slopes there are open woods of oak plentifully covered with a yellow *Dendrobium*, which flowers when the tree comes into leaf. The combination of yellow and brown-green with the intense blue sky above is of unequalled beauty. The known species of ferns number 200, several of them tree-ferns forty feet in height. The *Gesneraceæ* are another striking order, and the *Æschynanthus superba* is a most exquisite flower. The insect life is as splendid and varied as the flora, especially in the hot gorges of the precipitous southern escarpment. The Atlas moth sometimes exceeds 11 inches in breadth. The great enchantment of Khasia is due to its variety. As you walk along the road you have on the one side a deep gorge full of sub-tropical vegetation and on the other an open upland country which might be situated in Wales. Sun-birds and cuckoos, elephants, tigers, and ant-eaters dwell here side by side.

A report of this lecture is given in the *Journal of the Imperial Institute* (No. 4), a publication which has been issued monthly since the beginning of the year.

Borneo.—Professor Molengraaff has crossed the watershed into the Southern Province, taking a route rather more to the west than that followed by Capt. Van der Willigen (see p. 191). He ascended the Sungei Lekawai, as mentioned on p. 140, to the Dyak house Moriboi, and climbed the Bunut Sedarung and the Bt. Raja, 7474 feet high. To the south-west of the latter, separated from it by a deep valley, stands the Melaban Bolie, a summit which appeared to Prof. Molen-

graaff as high, or perhaps even a little higher, than the Bt. Raja. Returning to Moriboi, Prof. Molengraaff marched eastward, and, crossing the watershed at an elevation of about 1900 feet, came to the Sungei Kowin, and camped at an elevation of 620 feet above sea-level. The southern slope of the watershed is much steeper than the northern. Having procured a *sampan*, Prof. Molengraaff descended the Sungei Kowin (formerly called Temangoi), running considerable risk among the rapids, and on Oct. 16th reached the confluence of the S. Rassahoi which flows down from the Kait Boran, to the east of Bt. Raja. Below the junction the river is called Menyukui and is more than 30 yards broad. Dense forest of lofty trees clothes the banks and the adjacent hills. On October 17th the S. Samba was reached, which at the confluence is 68 yards broad, and on the next day the traveller came to the first Dyak settlement, peopled by Ulu-Ayers or Ot-Danoms. These people formerly dwelt in the Western Province, but were driven out by the Punans and settled on the head-waters of the streams flowing into the Java sea. The Samba is a beautiful river flowing through an undulating granite country, the monotony of which is broken only by groups or ranges of pyramidal or dome-shaped hills of andesite. Where these ranges cross the stream grand rapids are formed. Without any great difficulties Prof. Molengraaff reached the Katingan, a majestic stream, which he descended in six days to the Java sea, and then continued his journey to Banjermassin, where he embarked for Java.—*Tijdsch. van het K. Ned. Aardr. Genootschap*, Deel xii. No. 1.

AFRICA.

The Triangulation of Africa.—General E. F. Chapman, C.B., Director of the Intelligence Division, has written to the President of the Royal Geographical Society (*Geogr. Jour.*, May), urging the importance of a more systematic and complete survey of those parts of Africa which are under the administration of Europeans. He suggests that the coming Geographical Congress will afford a favourable opportunity for urging on the different Governments and Geographical Societies the advantage of united action.

In Cape Colony and Natal geodetic triangulation has been carried out, but it has not been connected with the British Bechuanaland triangulation, and secondary and tertiary triangulation have been consistently carried through only in the last-mentioned territory. In Lower Egypt triangulation has been executed by the Irrigation Department for revenue purposes; but it is of little use, because money was not procurable to erect permanent marks. The French have been more alive to the necessity of a regular survey. They have produced excellent maps of Algiers, and are extending the survey over Tunis.

Great saving is effected by commencing a regular survey as soon as a country is occupied. The Surveyor-General of British Bechuanaland, in his report for 1890-91, spoke of the practical advantages obtained from the geodetic triangulation, which supplies the surveyors with correct data. Surveys based on erroneous data are often the cause of endless litigation and waste of money. The British South Africa Company has an excellent opportunity of taking the lead in this matter by starting a geodetic survey in Matabililand and Mashonaland, which might afterwards be carried across the Zambesi. In Nyassaland as much labour has been spent in sketching routes and taking astronomical observations as would have sufficed to execute a trigonometrical survey of the greater portion of the territory. Accurate maps of many countries, where regular surveys cannot be carried out for years to come, are also desirable, and these General Chapman thinks might in time be obtained by plane-table surveys based on rapid triangulation. Work of

this kind has been executed by British officers in Somaliland, on the Anglo-German boundary in East Africa, at Wadi Halfa, at Suakin, and on the Anglo-Portuguese boundary in South-East Africa.

In conclusion, General Chapman proposes that the Congress should be invited to consider (1) the economic and scientific advantages of extending geodetic surveys in Africa; (2) the importance, in countries at present beyond the reach of geodetic surveys, of making rough surveys of areas, rather than of routes, and basing them on rapid theodolite triangulations, where possible; (3) the desirableness of a complete record of all points accurately fixed astronomically in districts which have not been triangulated, and of combining measures to determine new positions; and (4) the advantage to geodetic science of connecting the triangulation of India with that of Europe by joining it to the Russian triangulation of Transcaucasia.

AMERICA.

A Great Pre-Glacial River in Northern Canada.—At the recent annual meeting of the Royal Society of Canada, held in Ottawa in May, Dr. Robert Bell of the Geological Survey read a paper on the above subject, illustrated by a map which he had prepared as the result of much study and extensive observation in the northern regions. The following abstract is from the *Ottawa Journal*:—

"It was, he said, generally conceded by geologists that, just before the advent of the glacial epoch, the continent of North America stood at a considerably greater elevation than at present; the difference, according to some authorities, amounting to 2000 or 3000 feet, if not more. The difference was greater towards the south, as compared with the present general altitudes. The inevitable result of this would be to greatly alter the river systems. We should find in Northern Canada a wide central drainage area equal to about one-third of the present land surface of the continent, the centre of which would be in the region now covered by Hudson Bay.

"This great inland sea does not average 400 feet in depth, and it would be all dry land even with a very moderate elevation.

"Hudson Strait is much deeper, and it would either form a long bay or a river valley, according to the amount of the continental elevation.

"Some geologists think that about this time the upper part of the St. Lawrence basin, including all the lakes, except Ontario, discharged its waters northward from Lake Superior. But, even without this doubtful part, the drainage area of this one great northern river would be seven times that of the present St. Lawrence. Judging from the ancient erosion of the valleys and from other considerations, the annual precipitation was at least as great then as now, so that this former river must have been of gigantic proportions compared with any river of the present world.

"Its catchment basin would extend from the sources of the Saskatchewan and the Athabasca, in the Rocky mountains, to near the eastern coast of Labrador, and from the Minnesota river in the south to the northern part of Baffin Land, and would also include the southern part of the great Mackenzie basin. It would flow through the centre of Hudson Bay and down Hudson Strait. The former existence of this great river was not a mere speculation as to what might have been, but a necessary consequence of the elevation and change in the slope of the land, and it was proved in detail by a multitude of concordant facts all over the territory involved."

Tides and Currents in Canadian Waters.—Mr. W. Bell Dawson, C.E., has sent us two reports of the investigation carried on under his supervision into the move-

ments of the tides and currents in the Gulf of St. Lawrence. The importance of this undertaking was first discussed at the meeting of the British Association in Montreal in 1884, and a few observations were taken by Lieut. Gordon, R.N., and Staff-Commander Maxwell, R.N., in 1887; but no attempts to carry out the work systematically were made till the autumn of 1888. Lieut. Gordon expressed in his report his conviction that a large proportion of the loss of human life and merchandise in the Gulf of St. Lawrence was due to lack of information regarding tidal currents. In the eighteen years from 1870 to 1887 the aggregate loss of goods amounted in value to fifty million dollars or an average of $2,780,000 per annum, and in the same period 4308 persons perished.

After several memorials had been presented to the Canadian ministers, a commencement was made in 1890. Mr. Carpmael, Director of the Meteorological Service, gave his assistance in ascertaining the best form of gauge, and Professor G. H. Darwin, of Cambridge, was also consulted. The gauge finally decided on was the invention of Lord Kelvin. The points chosen by Mr. Carpmael for the erection of the first gauges, with the advice of Mr. T. C. Mendenhall, of the United States Coast Survey, were Father Point, the south-west point of Anticosti Island, and the harbour of St. John, N.B. Three gauges purchased subsequently were located at the Magdalen Islands, St. Paul Island, C.B., and the harbour of Quebec, and another was afterwards placed at Forteau Bay in the Strait of Belle Isle. The tide gauge consists of a cylinder rotated by clock-work once in twenty-four hours, around which a sheet of graduated paper is rolled. The tide as it rises and falls causes a float to move up and down a tube, which in its turn acts on a pencil in contact with the revolving cylinder. Beside the recording gauge, a second vertical pipe with a staff upon it constitutes a sight gauge which is read twice a day. The vertical pipes are heated in winter to prevent freezing.

The times of high and low water at the principal harbours of the country, and the range of the tides; secondly, the times of high and low water at the smaller ports, and the depth of water over shoals and bars at their entrances; and, thirdly, the effects of the tides in producing currents, are the data of importance to shipping. The Gulf of St. Lawrence has two main entrances—the Strait of Belle Isle and Cabot Strait, between Cape Breton and Newfoundland. The former is only about ten miles wide and forty fathoms deep, while the latter has a breadth of sixty miles and a depth of about 250 fathoms. Compared to the latter entrance, the Strait of Belle Isle may seem unimportant; but it should be remembered that a current of only half a mile an hour would carry into the Gulf a volume of water twenty times greater than the discharge of the river. The main tide, however, undoubtedly enters by Cabot Strait from the general tidal wave in the Atlantic. It is a remarkable fact that the tidal wave which enters here does not lose itself in the Gulf, but is found with a greater range than before in the passage between Gaspé and Anticosti, and continues its course, with ever increasing height, up to Quebec. Its progress must be largely guided by a deep channel crossing the whole Gulf from Cabot Strait to the passage referred to, and up the St. Lawrence nearly to the Saguenay. It extends for a distance of 500 miles, with an average breadth of thirty-five miles and a continuous depth of over 150 fathoms.

In order to ascertain the movements of the currents, Mr. Dawson and his assistants embarked on the *Lansdowne*, spending the months of July and September in the Strait of Belle Isle, and August in the Cabot Strait. It has been generally assumed that the current in the Strait of Belle Isle runs constantly inwards, but this is probably not entirely correct. The presence of icebergs has been instanced, but for ten icebergs that enter the channel fifty pass the mouth. The current here is fundamentally a tidal one. On some occasions the current ran

east and west for equal periods, and this may be considered its normal condition. The effect of the wind on the currents in this strait, where the range of the tide is only four feet and the current seldom exceeds two knots an hour, is very marked. But it appears probable that the tendency of the current to flow in the same direction as the wind is due to the combined influence of the wind itself and to differences in barometric pressure over wide areas. It was also found that on the south side of the strait there was a greater tendency to tidal regularity, and on the north side to persistency of flow in one direction or the other. The greatest velocities which were observed in July and September, during heavy winds, were :— from the east, 3·15 knots ; and from the west, 2·50 knots per hour. The actual flow throughout the year, when the influence of the wind is included, appears, on the whole, to be greater in the inward direction.

In the Cabot Strait the current was found to run in general outwards on the west side and inwards on the east. It does not seem to affect the water below 60 or 80 fathoms at most. The temperatures of both currents are nearly the same, and, as the volumes of water entering and leaving the strait are the same, the loss or gain of heat is less marked than with an upper and lower current ; the actual balance is, however, on the side of loss of heat, for the outflowing water on the western side has the higher temperature. These currents should be traced further.

Mr. Dawson's pamphlets are of great interest to students of currents ; they contain tables of the turn of the tide, temperature, and density, and sketch-maps of the straits. When the work is accomplished in the St. Lawrence, the land-locked waters of British Columbia will be examined.

Nicaragua.—The Government of this State is bent on doing all it can to open up the country and develop its resources. In vol. ix. p. 320, the geological exploration of the eastern slope by Dr. Mierisch was described, and now the same traveller gives, in *Petermanns Mitt.*, Bd. xli. No. 3, an account of his journey in 1893, also undertaken on behalf of the Government, across Nicaragua from the Managua lake to Cabo Gracias a Dios.

The whole of the lowlands of Nicaragua containing the two large lakes is covered with volcanic products of recent origin, for the most part sand and ashes and seldom compact lava. In consequence of the vitreous matrix contained in these deposits, they are subject to very rapid disintegration. Hence, it is true, soil favourable for the growth of vegetation is formed, but, on the other hand, a part of this silica is dissolved, and, on the evaporation of the water, binds together the subjacent sands, rendering them less susceptible to atmospheric action and forming a soft sandstone, which is very suitable for building purposes but useless to the agriculturist ; where this stone appears grazing is the only industry possible.

In dry years no water flows out of the Managua lake, and this may happen for several years in succession. It is singular, therefore, that the lake contains so little salt ; the quantity of soda in it is comparatively large. The water of the crater lake of Tucapa is similar in composition, while that of the crater lake of Nejapa holds in solution a much larger quantity of soda, and is beneficial in cases of skin disease. No fish live in the Nejapa lake, whereas the Asosoxa, close by, which is also a crater lake, has good clear drinking water and swarms with fish. Whence the Managua lake receives its soda Dr. Mierisch cannot explain. It cannot come from the rivers nor from the ground water, for analysis of the water of springs has shown only a slight admixture of soda. Nor can it come from the hot springs (106° F.) at the foot of the volcano Monotombo, as has also been proved by analysis. Yet, that it must be of volcanic origin, the large proportion of soda in the Nejapa lake seems to indicate, for this lake is beyond doubt of volcanic origin.

After passing the river Tipitapa, a swamp sparsely covered with grass and brushwood is entered, which extends for nine miles to the neighbourhood of the extinct volcano, San Jacinto, where the land rises and is suitable for agriculture, but only in parts; for most of the ground consists of *Talpetate*, the sandstone already alluded to. Here, at a relative height of only 50 feet, is the watershed between the Tipitapa and the Malacatoya, a river which in the rainy season pours large quantities of water into the Nicaragua lake, while in the dry season it is reduced to a trickling stream. At La Bandera the river forms the boundary between the andesite of recent origin and the formations of earlier periods. Beyond are found melaphyre and porphyry, of which at least half of Nicaragua is composed, especially the central portion. The porphyry consists of innumerable varieties, while the melaphyre exhibits fewer mineralogical differences, though very varied in structure. Both are converted on weathering into a reddish clay, which forms a heavy but very fertile soil. But the ground being not very permeable, swamps are frequent, especially where tuff occurs, and in many places large blocks of stone prevent the water from flowing off and add to the difficulty of travelling across the country. The road from Boaco to Muy-Muy is, perhaps, the worst in Nicaragua. It crosses a plateau between the streams flowing to the Nicaragua lake and the Rio Grande, where there is much excellent pasturage, but also terrible swamps. The climate, in spite of the elevation, 1000 feet, is remarkably unhealthy, especially at Muy-Muy and San Jeronimo, the unhealthiest places in the country. Beyond, the land rises towards San Ramon, north-west of San Jeronimo. San Ramon lies 1700 feet above sea-level, and on the land around thrive all the useful plants of the Tropics, and, in favourable spots, coffee grows well. To the west, a road rising to a height of 2350 feet leads across a range to Matagalpa on the Rio Grande. To the north also lie mountains crowned with grand forests and admirably adapted for coffee-growing. The soil cannot be surpassed in any country in the world. The whole of the ground from Matagalpa to Jinotega is heavy clay produced by the weathering of the porphyry, but it is covered with a layer of pure humus sometimes four to five feet deep. The climate is splendid; the temperature falls at night to 50° F. and lower, and even Europeans can work hard in this country. The rainfall is slight, but there is no lack of water, which runs in small brooks down every hollow.

At present, however, this natural source of wealth lies fallow for want of an outlet for the crops that might be raised. A railway is the only means of opening up the country, for the swamps on the west make the construction of a good cart road impossible, while on the Atlantic side the rivers Rio Grande and Tuma are useless for navigation, being encumbered with numerous falls and rapids. A railway might be constructed from Monotombo to Matagalpa and San Ramon, and along the Rio Grande to the boundary of the Mosquito reserve, from which point the river is navigable by steamers, or it might run to Jinotega and follow the Tuma river to Las dos Bocas, where it would join the former route. The land through which the Tuma flows is exceedingly fertile, and cocoa grows wild in the woods on its banks; sugarcane, bananas, maize, rice, and other crops might also be raised, the wide-stretching low grounds beside the river and its tributaries offering brilliant prospects for plantations. On the Rio Grande the quality of the soil is not so promising; good land is not found above the mouth of the Rio Olama, and though beyond the soil is little inferior to that on the Tuma, the extensive flats so common on that river are absent, as the mountains come down closer to the bed of the stream. In distance the two routes to the Atlantic are about the same, namely, 120 miles, but along the Rio Grande the railway would be forced by the mountains to keep more closely to the river and follow its windings. Another advantage the Rio Tuma

presents is that it has few large affluents on its right bank, and therefore fewer bridges would be necessary.

The route from Jinotega to Prinzapolca crosses first the llanos of Jinotega, an extensive plateau 3000 feet high partly covered with swamps. At Bonetillo the Tuma breaks through the mountains which stretch from Jinotega in a north-easterly direction and form a sharp climatic limit. On the east lies the rainy Atlantic region, and on the west the less rainy high plateaus of Segovia, consisting for the most part of pasturage. Numerous streams of crystal-clear water take their rise on the eastern slope. The soil is remarkably fruitful, and the climate damp but mild —a perpetual spring. The whole country is uninhabited and clothed with primeval forest, and, as the ground is everywhere of the heavy clay already mentioned, travelling is exceedingly difficult. In the rainy season this route to Prinzapolca is quite impassable, and in the dry season, if it can be so called, it can only be traversed with oxen, and these often fail, probably from want of sufficient fodder, as the skeletons lying along the route testify. The changes of level are considerable and the ascents steep ; the traveller has often to climb to heights of 2000 to 2800 feet. At the Uani, a tributary of the Prinzapolca, the mining district is reached. Alluvial gold washing does not promise good results, but the mines, especially in the district of La Concepcion, have turned out well. In Pis-Pis also new veins have been discovered which, though not very rich, are of great thickness. The track from La Concepcion runs along a ridge of andesite 2000 feet high, and in the diabase region of Pis-Pis there are numerous andesite and basalt cones. Near the Constancia mine, at the fall of the Pis-Pis, porphyry is again met with, which extends along that river and the Vaspuc nearly to the mouth of the latter in the Rio Coco. There, a red sandy clay appears, no doubt identical with the Triassic strata on the Rio Grande, Tuma, Prinzapolca, and Cuculaia. This clay underlies the whole of the low-lying plain of the Rio Coco, but crops out only at a few spots, being overlaid by Tertiary deposits composed exclusively of quartz detritus. Being very permeable and not easily weathered down into soft soil, these deposits are not very favourable for crops, but the thin layer of earth on the surface suffices to nourish a rich covering of grass, and firs flourish in the dry ground. These savannahs have also the advantage of being free from swamps and are therefore more healthy and more easily traversed.

The Rio Coco is navigable by steamers from above the mouth of the Vaspuc, but in the dry season the vessels must not draw more than a foot of water. By the expenditure of a small sum the Vaspuc might also be rendered navigable by large boats, and even small steamers, as far as the falls of the Pis-Pis. One circumstance that hinders the progress of Cabo Gracias, and consequently of the Rio Coco district, is the bar of the river, which has only three to four feet of water over it. Hurricanes work from time to time great devastation.

ANTARCTIC.

The Voyage of the "Antarctic."—It was recorded on p. 201 that this vessel had attained a higher southern latitude than has ever been reached except by Weddell and Sir J. Clark Ross. Mr. C. Egeberg Borchgrevink endeavoured to obtain a passage on the *Antarctic* with the object of making scientific observations, and, failing in this, he shipped as a seaman. On his return to Melbourne he read a paper before the Royal Geographical Society of Australasia, a summary of which is published in the *Geographical Journal* for June.

Melbourne was left on September 20th and Hobart on October 3rd, and the

course was set for Royal Company Island. On the 18th, the ship being near Macquarie Island, in about lat. 54°, the Aurora Australis was visible for the first time, in the form of an ellipse with an elevation of 35° above the southern horizon. Campbell Island, rising in numberless conical peaks of volcanic origin to a height of from 300 to 2000 feet above the sea, was next touched. The land around the base is rich in vegetation : ducks were numerous, and Mr. Borchgrevink secured three snipe (*Gallinago australis*). On November 6th, in lat. 58° 14′ and long. 162° 35′ E., an immense barrier or chain of icebergs was sighted ; it extended for 40 to 60 miles, the highest point being somewhat over 600 feet. Here the propeller was found to be out of order and the vessel had to return to Port Chalmers.

At the beginning of December it was again in the Antarctic regions. At 53° the albatross was left behind and likewise the Cape pigeon (*Daption Capensis*), but the white-bellied petrel was still seen, and a lestris (skua) and a small blue petrel put in an appearance. On December 8th, in lat. 62° 45′ and long. 171° 30 E., large streams of ice were drifting round the ship and a strong ice-blink appeared towards the south, and in the evening the floes of the outer edge of the pack-ice, large and hummocky, were reached. Multitudes of the *Argonauta antarctica* were swimming in the cavities in the ice-floes, and large-finned whales, called in Norway blue whales, were spouting in all directions ; penguins also were plentiful. When the pack was entered the air temperature was 25° F. and that of the water 28°, which it retained all through the pack. On the 14th Balleny Island was reached in lat. 66° 44′, and long. 164° E., exactly the position assigned to it by Ross. Its lofty peaks rise to 12,000 feet above sea-level. On December 22nd, in lat. 66° 3′, long. 157° 37′ E. Mr. Borchgrevink shot a singular seal of ordinary size and colour, but without any signs of ears and with a very thick neck. On December 26th the Antarctic circle was crossed and on January 14th the ship came again into open water after 38 days' struggle through the ice. On the 18th the temperature of the air was 32° and of the water 30°, the sky being comparatively clear. At noon Cape Adare was approached, which lies in lat. 71° 23′ and long. 169° 56′ E. and consists of a large, square, basaltic rock with perpendicular sides. From here the coast of Victoria Land was visible to the west and south as far as the eye could reach. It rose from dark, bare rocks into peaks of perpetual ice and snow, 12,000 feet above the sea, Mount Sabine towering above the others. Twenty glaciers were counted about the vicinity of Cape Adare. One of them seemed to be covered with two layers of lava separated by a thick layer of snow. A volcanic peak, about 8000 feet high, was comparatively free of snow and had undoubtedly been in activity not long before. The crew of the *Antarctic* were the first human beings to set foot, at Cape Adare, on the Antarctic Continent.

On the 18th the northern Possession Island was sighted, consisting of vesicular lava rising in the south-west to peaks of 3000 feet in height. Penguins swarmed on it, and the ground was covered with a thick coating of guano. Thirty feet above sea-level Mr. Borchgrevink found a cellular cryptogamous plant, probably a lichen. The next island, in lat. 71° 56′ and long. 171° 10′, with an area of 300 to 350 acres, was named after Sir James Ross, and the eastern cape of Coulman Island was named Cape Oscar after the King of Norway and Sweden. Off Coulman Island the compass was subject to very marked irregularities. On the 22nd the vessel was in lat. 74°, and, as no whales appeared, it was decided to return northwards. After touching again at Cape Adare the *Antarctic* entered the ice in lat. 69° 52′ and long. 169° 56′ E., and this time emerged again into open water after only six days' steaming. On February 17th the aurora was seen in unusual brilliancy, presenting long shining curtains rising and falling in wonderful shapes and shades. In lat.

44° 35′ and long. 147° 34′ E. a great number of sperm whales were seen. The *Antarctic* entered Port Phillip Heads on March 12th, five months and a half after its departure from Melbourne.

MISCELLANEOUS.

M. Andrée, a Swedish engineer, intends to make an attempt to reach the **North Pole** by balloon in 1896. The place chosen for the ascent is the Norskoarna, Spitzbergen, 600 miles distant from the Pole.—*Comptes Rendus*, Nos. 9 and 10.

An expedition consisting of Messrs. G. Becker, W. H. Dall and Partington, was to leave Washington on May 16th for **Alaska**, in order to examine the coal deposits and gold mines which had been discovered, and to obtain some idea of their value.—*Revue Scientifique*, May.

The giant **Ruapehu**, which has been quiescent for a long period, has lately burst out again. It is the highest mountain of North Island, New Zealand. The group, which includes Tongariro (6000 feet), Ngauruhoe (7515 feet), and Ruapehu (8878 feet), has lately been acquired by the Government to be reserved as a national park.—*Colonies and India*, May 11th.

A petition has been presented by English capitalists to the Icelandic Althing for a concession for a line of **railway** from **Reykjavik** to the Thingvalla lake, a distance of about 30 miles. In connection with this undertaking a bimensual service of steamers is to be established between Liverpool and Reykjavik. The project, passed by a small majority in the Lower House, will be discussed in the Senate next August.—*Bull. de la Soc. R. Belge de Géographie*, No. 1, 1895.

A curious phenomenon is reported by Dr. J. G. F. Riedel. Along the west coast of the island of **Aalor** or Ombaai, lying approximately in 124° 20′ E. long. and 8° 10′ S. lat., an icy-cold current flows at every new moon in the month of April and later, as long as the east monsoon continues to blow. So cold is the stream, that fish of fair size, especially those only slightly covered with scales, die of cold if they happen to get into it, and are picked up by the natives. Unfortunately, this phenomenon did not occur at the time of Dr. Riedel's visit to the island, so that he was unable to examine it.—*Globus*, May.

A concession has been obtained from the King of Siam by Mr. Ch. Dunlop for a railway across the **Malay Peninsula**. Starting from Alor Sta, at the mouth of the Kedah river, it will proceed north-eastward for a distance of seventy to eighty miles, and terminate at Senggora on the Gulf of Siam. Another section will be constructed from Alor Sta southwards to Kulim, the chief tin-mining centre of the Siamese Malay States, and permission has been obtained from the British Resident in Perak to continue this line to Selama. A still more important part of the scheme is the extension of the railway from Kulim seawards to Prye Dock opposite Penang. At present, however, only the trans-peninsular line will be proceeded with.

NEW BOOKS.

Sir Samuel Baker: A Memoir. By G. Douglas Murray, F.R.G.S. and A. Silva White, Hon. F.R.S.G.S. London: Macmillan and Co, 1895. Pp. 425. Appendices and Maps. *Price* 16*s.*

The authors of the Life of Sir Samuel Baker had a most enviable task. They had to portray a real Briton and to deal with a vast subject of national importance —the Nile and its sources; also with the noble attempt to put down the slave trade in the Egyptian Soudan and with the annexation of the Soudan by Egypt.

Dedicated, as this work is, to her Most Gracious Majesty Victoria, Queen of Great Britain and Ireland, by special permission, one naturally expects something well worthy of perusal. Nor is one disappointed; for although at first sight the editors may be thought to have gone out of their province and to have introduced matter which did not affect Baker's active life, yet, on further consideration, it will be found that they are justified, for they give a very good and trustworthy account of what was, after all, the most striking outcome of the work which the subject of the volume undertook.

Very possibly, were it not for the great events in the Soudan of more recent years, Baker's praises would not have been sung, and therefore a view of the great Soudan question from its beginning to the present day will almost of necessity show how Sir S. Baker began the work there, how it was continued, how it was, by crass stupidity, brought to naught, and how his ideas as to the future of that great land, and the many questions connected with it, were just or the reverse.

Baker, after he took up Speke and Grant's work of exploration in the Southern Nile regions and discovered the Albert Nyanza and the Murchison Falls—a work of such importance that of itself it would have made his name famous—was, owing to various circumstances, given by his Highness the Khedive Ismail a mission to suppress the slave-trade, and to annex to Egypt the lands between Khartum and the Equator. This he did, with what difficulties, hardships, and adventures for himself, his noble wife, and nephew this volume graphically and fully shows. The work which he then began is not yet finished, and one pauses for an answer to the question what the outcome of it yet may be, owing to party politics and international jealousies, which sacrifice right and justice, honour and lives, for temporary popular applause.

Sir Samuel Baker knew, and was the first to point out, what a splendid field for commerce Egypt might possess in the far-off lands to the south. Put down the slave-trade, open up true avenues of legitimate trade, and the prosperity of Egypt was assured. Had his policy been well carried out, had his foresighted plans been heartily developed, a rich harvest would have been won for Egypt by now. But the Oriental mind, the Oriental procrastination was at work, and it has been shown to be well-nigh impossible to deal with such problems from a Western point of view. Baker failed and so did Gordon. Why? Not from want of initial energy, pluck, endurance, and knowledge, but from utter want of backing up from Europe and from the Ruler of Egypt, and from a lax policy which was permitted to be maintained in Egypt by the tribe of Pashas and place-seekers.

Had the Khedive been made to understand the problem set before him, had he only been enlightened as to what might be, he would no doubt have risen to the occasion and crushed, as he might have done, the slave-trade in Egypt. Unfortunately, dual advice was given him, and France, who now wants these Soudan lands, really by diplomatic means "blocked the way" for their development. It

goes without saying that if Khartum were in European hands—we will not say British hands—great benefit would accrue to Egypt ; and, moreover, if the lands of which Khartum is the key were in European hands, the commerce and politics of the Nile valley would undergo a mighty change. Why cannot these international rivalries be put an end to ? Sir S. Baker's life shows to the full what evil they produce and what grievous harm to the people whom the European nations profess to help. It will not do, though material enough is given, to compare Baker's work with Gordon's. The two men were cast in two widely different moulds, and each, as can be seen from the letters published, had a very different standard before him, a very different goal in view. Had we not had in this volume Gordon's letters, Gordon's views, we could not so well have understood Baker's endeavours and aspirations. Looked at afterwards, both he and Gordon were both right, both wrong. However, each had an ideal view, and how both might have won the "golden fleece" each sought so gloriously to win, is also seen, for both failed to realise the power of evil fighting behind their backs.

Both men were too loyal themselves to suspect the half of the baseness of their employers, and the men whom they employed—hence failure ; but a failure well worth the sacrifices both made, for it has been a lesson to the nations which will last for all time, and will some day bear fruit.

Baker, the man of war, the mighty hunter, the man of adventure, is well depicted ; and we are sure that no one who takes up this book will read it without interest and great profit. We commend it, too, to the politicians. They may learn valuable lessons, if they will, from the tale unfolded.

We congratulate the authors on their very successful work.

Western Origin of the Early Chinese Civilisation from 2300 *B.C. to* 200 *A.D.* By Terrien de Lacouperie. London : Asher and Co., 1894. Pp. xiii + 418.

It has long been a common belief that the Chinese civilisation was of indigenous origin, and, moreover, of such a very remote antiquity that it extended far beyond even that of the pyramids themselves. This work will suffice, we think, to convince any reader of an open mind that this belief has no better warrant than the assertions of the Chinese themselves, and that it is opposed to a great variety of facts, which the comparative study of the Chinese and Babylonian languages, literatures, and civilisations has in recent times brought to light. The author, Dr. de Lacouperie, who pursued this particular line of study with uncommon ardour, was, to the deep regret of the learned world, cut off by an attack of typhoid fever in October last. Among Sinologists this great scholar was distinguished for his investigations into the most archaic forms of the Chinese written characters, for the catalogue which he prepared of the Chinese coins in the British Museum, and for his translations of some of the chapters of the oldest and most difficult book of the Chinese, *The Book of Changes*, the interpretation of which had been given up as hopeless even by the Chinese themselves. His work under notice marks a distinct epoch of advance in the process of dissipating the mists in which Chinese antiquity has been so darkly enshrouded, and will prove a lasting monument to the fame of its author.

In 1888 he published a work regarding the languages spoken by the tribes which occupied China before the Chinese ; and in the present one it is his aim to show that these tribes were gradually conquered by a race of men who penetrated into China from the west, and introduced for the first time into that country the arts of civilised life. The Chinese themselves, in their early national souvenirs, have no traces or traditions of savage beginnings, slow development of civilisation,

pictorial rudiments of writing, and successive advances of knowledge by self-growth. On the contrary, all their culture and all their precepts of highest wisdom they regard as divine gifts bequeathed to them by their earliest ancestors, for whom, accordingly, they entertain feelings of the profoundest veneration. This fact of itself affords a strong presumption in favour of the soundness of the author's theory. China, he has discovered, owes its civilisation to certain Bak tribes, of Babylonian and Elamite descent, which, under a leader called Nakhunte—or, as the name appears in Chinese, Nai-kwang-ti—entered the country in the year 2282 B.C. He led his people into Chinese Turkestan, and then along the Kashgar or Tarym river, until, after a time, he reached, to eastward of the Kuen-lun, the *Flowery Land*—a name to which its great fertility had long entitled it. These immigrants settled at first in the south-west corner of Kansuh, the north-western province of China ; and thence gradually diffused themselves—first along the banks of the Hoang-ho, and afterwards both to the north and the south of that river—until, in the course of ages, they either exterminated or absorbed into their ranks all the aboriginal races. Our author ascribes to them the following characteristics : A fair complexion, blue eyes, no black hair, and no high cheek-bones, artificial tapering of the head, the worship of ancestors, veneration of the sky-heaven, building in pisé, clay vaults for tombs, scorching the tortoise-shell for divination, a special taste for jade, important traditions concerning their relations with Chaldeo-Elamites, a tradition that Dungi was their first initiator into the art of writing, an adaptation of the Chaldean version of the deluge to the mountainous region of Badakshan, and the name of Hu-Nak-Khunte for their leader. He then specifies no fewer than 160 items or elements of civilisation, traceable to antecedents in Western Asia, which the Baks imported with them into China, and the existence of which in the country is attested by statements in its history, traditions, and legends. These items he enumerates under four heads, as determined by their relation to : (*a*) sciences and arts ; (*b*) writing and literature ; (*c*) institutions, government, and religion ; (*d*) historical traditions and legends ; and he then shows that the source of all these elements was in Elam—that is, Susiana. The limited space at our command does not admit of our specifying these, even in part ; but we may say that they seem fully to prove the author's contention. In subsequent chapters he shows what accessions to her culture China gradually received from her commercial intercourse with foreign countries, whether near or remote, up to the end of the second century of our era. The work, apart altogether from any consideration of the truth or otherwise of the theory it advocates, is an invaluable repertory of information regarding the condition of China at the successive periods of her early history. The facts, collected from a vast variety of sources, testify to the industry in research and wide learning of the lamented author.

The Partition of Africa. By J. Scott Keltie. With 24 Maps. Second Edition. London : Edward Stanford, 1895. Pp. 517. Two Appendices and Index. *Price* 16*s.*

We had the pleasure of reviewing with favour the first edition of Mr. Scott Keltie's valuable work, and our previous commendation can be transferred with still more force to this, the second, edition.

As a work dealing with the partition and industrial development of Africa it stands without a rival, and fresh interest is added to this edition by the numerous changes which have taken place in the political and commercial aspects of the continent. Our author has kept himself well abreast with the most recent develop-

ments, and it would require a most careful reader to catch him tripping. In this edition Mr. Scott Keltie has been very anxious not to give any patriotic bias to his views, and the fact that he has owned his indebtedness to Mr. J. Batalha Reis should be a proof that his endeavours have been in earnest.

Seventy pages have been added to the book, and important additions have been made to the maps, so that, as the whole work has been well revised, we can almost say that it is a new one.

It is only pressure on our space which prevents a longer notice of this work. Reliable as it is, we can heartily wish it a very large circulation.

Human Nature in Rural India. By R. Carstairs, Bengal Civil Service, author of *British Work in India.* Edinburgh and London: William Blackwood and Sons, 1895. Pp. 344.

Mr. Carstairs gives the impressions of the character and life of a cultivator in a Bengal village, which have gradually been formed in his mind as the result of personal contact with the people during twenty years of active service in that province; and he endeavours to show their bearing on some of the most serious problems with which the British government has to deal in legislating for the people, and grappling with the many evils which it tries to remedy. The ideals and motives which more or less consciously the cultivator cherishes, or which have influenced and guided himself, or which determine the action of government, he has styled "dreams." The phrase is not altogether a happy one. Dreams, even day dreams, are unsubstantial creations which fade away in the light of open day, or when one looks fixedly at solid realities. They give the notion rather of what one would like to see, than of insight into the nature of men and things, and of what a man will hopefully and seriously strive to realise. Still, leaving out of account the suitableness of this phrase, the book is one of real value. Though the treatment of the subject is rather sketchy, the representation of the facts of life and character is penetrating and truthful, and gives prominence to features which are only too apt to be overlooked by administrators who are naturally prone to be guided by prepossessions based on Western life, and circumstances in which they have been reared and to which they are accustomed. It emphasises strongly the supreme importance of taking into account, in all legislation and administration, the phases of human nature actually developed among the people as the result of their past history and peculiar social relations, and the folly, nay, the danger, of being guided solely by Western experience or abstract theories of what is best in itself. There is special need for such warnings, and the existence of the danger cannot be too often reiterated when so many in England, with the best intentions, but in ignorance of vital elements, are inclined to countenance and support agitators who seek to Europeanise the form and methods of administration. Though the right course is indicated only indirectly, and rather dreamily, and though there is a slight want of grappling with the questions in a practical way, the general effect is valuable, and apart from this practical aim, the truthful sketches of the villagers' life and surroundings will be found to be of great interest by every reader.

The Real Chinaman. By Chester Holcombe. London: Hodder and Stoughton, 1895. Pp. 350. *Price 7s. 6d.*

This is not the hurried work of a passing tourist, but the expression of the matured opinions of one who for many years was Interpreter, Secretary of Legation,

and Acting Minister of the United States of America, at Pekin. It is consequently a volume of great value, written as it is by one who enjoyed rare opportunities of peeping into the secrets of the most jealously shrouded country in the world. After all we have read of the barbarism of Chinamen, it is pleasant to learn from Mr. Holcombe, who really knows them, that they have many good qualities. "The Chinese is cautious, slow, conservative. But he has a sturdy independence of character, an innate and strongly developed love of his rights." Again, "the administrators of the affairs of State are chosen from among the people themselves"; there is no titled nobility, and there is a remarkable similarity between the governmental systems of China and the United States! Again, filial piety is the grand "original religion of the Chinese. It is taught in every text-book of every school, and from the beginning to the end of the educational course." Lastly, Mr. Holcombe thinks "China sets an example which all the world may wisely follow. In this empire, every one marries and no one 'boards.' Hence, generally speaking, there are as many wedded couples as there are men and women above the marriageable age, and as many present and prospective centres of home-life as there are couples married. Bachelors and old maids are conspicuous only because of their absence." It is not considered respectable for a Chinese widow to marry again. If she desires the praise and honour of all the nation, she will put an end to her existence on her husband's coffin. A Chinese widower, however, would make himself ridiculous if he mourned for his wife, and he may marry as many wives as he can support. Among the middle and poorer classes one wife is the universal rule, probably because "in shrill and voluminous scolding a Chinese woman has no equal." Chinamen have very strong home-ties, and never travel for pleasure, consequently they cannot comprehend our "globe-trotters." "The Chinese is an acute and careful merchant, a patient, faithful, and diligent labourer, but above everything else, he is a lover of his home." Weddings and funerals form the only excitements to the Chinese, who devote little time to amusement and recreation. A laborious system of etiquette governs all Chinese visits, and for men to refer to their female relations would be considered the height of rudeness. The Chinese gentleman is always a literary graduate, has often a fine library of ancient Chinese authors, and frequently makes a special study of antique porcelains, coins, pictures, etc.

Mr. Holcombe describes Chinese religions and superstitions, courts of law, officials, the poor, the Chinese financial system, etc., in thoughtful and most interesting chapters bearing evidence of keen observation and prolonged study. A special chapter is devoted to "Chinese Queues." This appendage is the symbol of Chinese manhood. It is only when a boy reaches the age of thirteen or fourteen that he is formally invested with the sober and dignified queue of manhood. It is not, however, an original institution, having been a Tartar custom introduced about 300 years ago by the present ruling family, which is itself foreign. The queue has now become an object of almost superstitious reverence and is combed and dressed with the greatest care. To pull it is an insult, and to cut it off a grave offence severely punishable by law. The etiquette of the queue is as exacting as everything else Chinese. A rowdy wears his queue loosely braided. If a traveller has coiled up his queue to keep it clean, and meets a friend, he must uncoil his queue before bowing to him. No servant dare appear before his master or mistress with a queue coiled.

The volume is bound in a shade of colour known in China as "Imperial yellow," which is set apart for the exclusive use of the Emperor, severe penalties attaching to its use by Chinese subjects. There are numerous illustrations.

In Tropical Lands. Recent Travels to the Sources of the Amazon, the West Indian Islands, and Ceylon. By ARTHUR SINCLAIR. Aberdeen: D. Wyllie and Son, 1895. Pp. 193.

A shrewd Aberdonian, Mr. Sinclair travelled with his eyes open when he visited Peru, the West Indies, and Ceylon; and this volume contains a description of what he saw, a map showing his route through Peru, and a useful list of the flora of Peru, besides numerous good illustrations. He was not struck with the virtues of the Hispano-Peruvian race. Their worst weakness is their utter inability to speak the truth. Again, "Peruvians are not famous as travellers. As a rule, they know very little of their country. They have their Geographical Society, forsooth! and possess maps, more or less inaccurate, compiled by industrious foreigners; but the richest portion of the interior is practically a *terra incognita* to them. 'Have you ever been to the interior?' I asked a leading authority in Lima. 'No, my dear sir,' was the naïve reply; 'I never but once rode twenty miles, and that was only because the Chilians were at my back.'"

As the teas of India and Ceylon now constitute 86 per cent. of the whole consumption in the United Kingdom, and tea-planting is so attractive, Mr. Sinclair's chapter on "Typical Failures" among Ceylon planters may be profitably consulted by those intending to settle there. The author has no doubt, however, that the Ceylon tea-industry will last, for (1) tea is not an exotic like coffee; (2) no island in the world produces tender leaf so profusely; (3) labour is cheap and abundant; (4) the crop is not exhausting like the fruit or seed crops taken from coffee or cocoa; and (5) there are tens of thousands of acres eminently suited for tea that never would have produced coffee. The only real danger is over-production.

Italien. Eine Frühlingsfahrt nach dem Süden. Von RICHARD NEUMANN. Leipzig: Gustav Uhl, 1895. Pp. 112. *Price* 2.50 *mark.*

Since the "Triple Alliance" was formed, the once hated "Tedeschi" have been welcome guests in Italy; and Germans are now almost as numerous as the English at Roman hotels. Herr Neumann gives us in this little volume his impressions of a visit to Italy during the spring of 1890, and rapidly conveys us from the Lake of Lugano to Genoa and its Riviera, Rome, Tivoli, Naples, Pompeii, Capri, Florence, and Venice—in short, he describes the "Circular Tour" which the Italian railway companies have made so familiar. He refers to the wholesale pulling down of ancient houses in Rome, and explains the enormous expense—which he is afraid will lead to the bankruptcy of the Eternal City—in a way we have not hitherto been acquainted with. He declares that the Romans desire to make their city "the greatest commercial port in Italy," and that this demolition of houses is preliminary to a ship-canal being cut from Rome to the sea, 14 miles distant. "Such a bold idea," he exclaims, "does all honour to its originators." Steamers from London to the Forum direct will certainly be a novelty.

Colin Campbell—Lord Clyde. By ARCHIBALD FORBES. London and New York: Macmillan and Co., 1895. Pp. viii+222. *Price* 2*s.* 6*d.*

This is an excellent addition to the series of monographs on *English Men of Action.* Mr. Forbes has told with great spirit and in an admirably clear style the stirring incidents and distinguished services of Lord Clyde's career as a soldier.

Of the inner life not much is said. There are probably not materials for doing justice to this side of his character, and the object of the series does not require an exhaustive study of the man. What is told is sufficient to produce a distinct impression that as a soldier Colin Campbell possessed qualities and achieved results which fully justify his fame and the high position which he reached. Whether he possessed the ability which would entitle him to rank among the world's great soldiers is doubtful. His career did not give opportunities of displaying what he could do to entitle him to a place among the foremost, nor has Mr. Forbes attempted to estimate his claims to such a rank ; but that he had in a large measure some of the indispensable and most valuable endowments of a good soldier is clearly shown. He was a first-class regimental officer, and he showed in the field that power of combining his forces, and quickness to detect and take advantage of opportunities given by an enemy, which are the secret of success ; while all through life he was animated by a stern sense of duty. The story of his campaigns is exceedingly well told, and altogether the picture of the man is both attractive and satisfying.

Deutschlands Kolonien: Ost-Afrika. Von Rochus Schmidt. Erster Band. Mit über hundert Bildern und zwei Karten. Berlin : Verlag des Vereins der Bücherfreunde (Schall und Grund), n.d. Pp. 259 and Index.

This is a popular account of the German East Africa colony, and has been written by Captain Schmidt, who has seen much service in that region. It is accurate, well written, and will be of value for those who would learn, from the German point of view, the events which have taken place in East Africa, the nature of the country and its inhabitants, and the hopes held out for its future development.

The illustrations are very good.

English Seamen: Howard, Clifford, Hawkins, Drake, Cavendish. By Robert Southey. Edited with an Introduction by David Hannay. London: Methuen and Co., 1895. Pp. xvi + 404. *Price* 6*s.*

This is a reprint of Southey's lives of Howard, Clifford, Hawkins, Drake and Cavendish, with an introduction by David Hannay, pointing out Southey's qualifications for his task.

The book is admirably printed, and it is to be regretted that it should be disfigured by the untidiness of uncut edges.

Ueber den Schiffsverkehr von Kinsay zu Marco Polo's Zeit. Von Friedrich Hirth. Extracted from the *T'oung-Pao*, and printed separately. Leyden, 1894. P. 7.

From a Chinese source the learned translator gives us some notion of the duties of the captain of an ocean-sailing ship, and of the slender empirical knowledge of meteorology and seamanship that he needed to possess.

La Géographie Littorale. Par J. Girard. Paris : Société d'Éditions Scientifiques, 1895. 8vo., pp. 228.

In this work the author gives a general sketch of the leading features presented by sea-coasts, and attempts to trace their origin. Treating first of the movements

of the waters of the sea, M. Girard next deals with the erosion of coasts, illustrating the subject by reference chiefly to the changes which have been effected on the coasts of the English Channel. Thereafter follows an interesting chapter on the movements of the sands, in which is discussed the formation of submarine banks, coastal ridges, isthmuses, dunes, etc. The author next treats of the several kinds of beaches and their origin, and subsequently devotes considerable space to a description of deltas and estuaries. A concluding chapter deals with the phenomena of old coast-lines and raised beaches and movements of the crust. The work, which is clearly written, and illustrated by numerous maps and diagrams, that serve their purpose well, may be recommended to those who are desirous of acquiring a general knowledge of the subjects it discusses. The descriptive portions are excellent, but the author has a somewhat imperfect knowledge of the geological aspect of his subject, and his treatment of the theoretical questions involved is therefore frequently unsatisfactory. The authorities cited are chiefly French, but English, German, Swedish, Russian, and other foreign writers are also referred to, —their names and the titles of their works being frequently misspelled and sometimes so mangled as to be with difficulty recognised. It is hard, for example, to recognise in "M. Torbuhn," the Swedish geologist, Herr Törnebohm. One looks for such carelessness in French newspapers, but hardly expects to meet with it in a work by the "Secrétaire-adjoint de la Société de Géographie."

Short Studies in Nature Knowledge: An Introduction to the Science of Physiography. By WILLIAM GEE. London: Macmillan and Co., 1895. Pp. xiv + 314.

This is hardly a satisfactory book. It is not a text-book of Physical Geography, for no attempt is made to explain or discuss the scientific facts and principles that underlie that science, and whenever these matters are approached their treatment is inadequate. Thus the discussion of winds brings up the old saying about "inrush of cold air to supply the vacancy." The book is largely made up of descriptive passages quoted from many books, and not always correctly. Thus Tennyson is made responsible for "the ringing *groves* of change"; the Book of Canticles for "*samphire* and spikenard"; and the Book of Exodus for "the Lord descended on Sinai *on fire*." In the part of the book for which the compiler is directly responsible the slips of language and more serious errors of fact are astonishingly frequent. We cull a few:—Columbus believed in an "undiscovered world far away in the west"; the farthest point north yet attained "was by Captain Markham"; "a new expedition is being prepared by Dr. Nansen"; the cañons of the Colorado and Yosemite are placed in the Rocky Mountains; mountains "form natural boundaries between continent and continent"; on the Malabar Coast "the rain-fall is the heaviest known"; the hydrostatic paradox is said to explain how deep-sea creatures are able without injury to sustain the pressure of the water above them; "waves move at right angles to the direction of the wind"; coral islands are limited "between 134° west longitude and 135° east"; the Albert and Victoria Nyanzas are utterly confused; in the account given of a blizzard, no mention is made of snow; Buys Ballot's Law is given only in the form that applies to the northern hemisphere; from the Zambesi Falls "steam columns" are said to arise; the area of the Rhine basin is given as 8000 square miles; the speech put into the mouth of Toscanelli is very poor, and contains a fine specimen of a mixed metaphor.

The book contains more than a hundred illustrations, many of them excellent, few of them poor; one is apparently wrongly called "Vesuvius."

Hygienische Meteorologie für Aerzte und Naturforscher. Von Prof. Dr. W. Y. van Bebber. Mit 42 in den Text gedruckten Abbildungen. Stuttgart: Verlag von Ferdinand Enke, 1895. Pp. 324 and Index.

Professor Van Bebber, the author of this book, is director of one of the departments in the Observatory at Hamburg, and is well qualified for the difficult task which he has undertaken, namely, to show, as far as possible, the relationship between meteorology and hygiene. It is a more or less new field, and although numerous small papers and dissertations have appeared on this subject, dealing with isolated facts, this is the first attempt, that we know of, which deals with the subject in a comprehensive and general manner. The ancients recognised that weather and health bore a near relation the one to the other, and numerous traditions have come down to us with reference to the influence of weather on disease and epidemics.

The great difficulty in dealing with this subject is that it will not do to use meteorological "means" to compare with hygiene under local circumstances; local "weather," of course, influences disease and death-rate more than mean annual temperature, mean annual rainfall, etc. Yet, of course, when dealing with a large area and definite diseases, the "mean" does have a definite relation to them. Our author has done his best to obviate this difficulty, and with much success.

The plan of the work is as follows:—After a description of air, temperature, rainfall, etc., the influence of each from a hygienic point of view is detailed.

The final chapter describes the special character of a sea or land climate, altitude and forests, and their influence on health. Then the Tropical, Temperate, and Polar zones are described, and the hygiene of each severally detailed.

We can strongly recommend the book, and congratulate the author on his successful work.

Ordnance Gazetteer of Scotland: A Survey of Scottish Topography, Statistical, Biographical, and Historical. Edited by Francis H. Groome. Vol. vi. Sad—Zet. London, Edinburgh, and Glasgow: William Mackenzie, n.d. Pp. 293-626.

This is the concluding volume of this admirable work, and fully maintains its high reputation for accuracy, thoroughness, and excellence of execution. The illustrations are of the highest possible quality. After the alphabetical gazetteer, this volume contains a "General Survey," consisting of a series of capital articles on the physical features, botany, geology, zoology, industries, commerce, education, history, languages, and literatures of the country. These are written by recognised authorities, and will be found replete with well-chosen and well-arranged matter. We take exception to the statement that *Viola odorata* is not included in Scotland's Flora. In Balfour's *Flora of Edinburgh* it is reported from eight stations. Also *Trichomanes radicans* was found on the Cock of Arran not twenty years ago.

Great Britain's Colonial and Indian Possessions: A Handy Reference Guide to the British Empire. London: John Walker and Co. Pp. 122. *Price* 1*s.*

This is indeed a 'Handy Guide to the British Empire,' and contains much condensed information as to the history and present condition of its various constituent parts. But why is that Empire called 'Great Britain's'?

NEW MAPS.

EUROPE.

SCOTLAND, W. and A. K. Johnston's New "Three Miles to Inch" Map of ——, for Tourists, Cyclists, and General Reference. Sheet 6. *Price* 1*s.* 6*d. on Cloth.*
Edinburgh and London: W. and A. K. Johnston.

The scale of these maps is small enough to allow the whole of Scotland to be represented on 16 sheets of moderate size; while it is large enough for the purposes of the ordinary tourist. Sheet 6 extends from Leith to Dumbarton, and from Ballinluig to Peebles. The main roads are distinctly marked in brown; streams and lakes appear in blue; woods in green. Of the last, more might have been shown; and, for cyclists, some indications of the character of the roads should be added. The general effect of the map is pleasing.

AFRICA.

POSSEDIMENTI ITALIANI, Carta dei ——, in Africa. Etiopia (Eritrea ed Abissinia) e Somalia. Del Prof. G. Dalla Vedova, 1895. Scala di 1 : 2,000,000 (1 cm. = 20 km.).

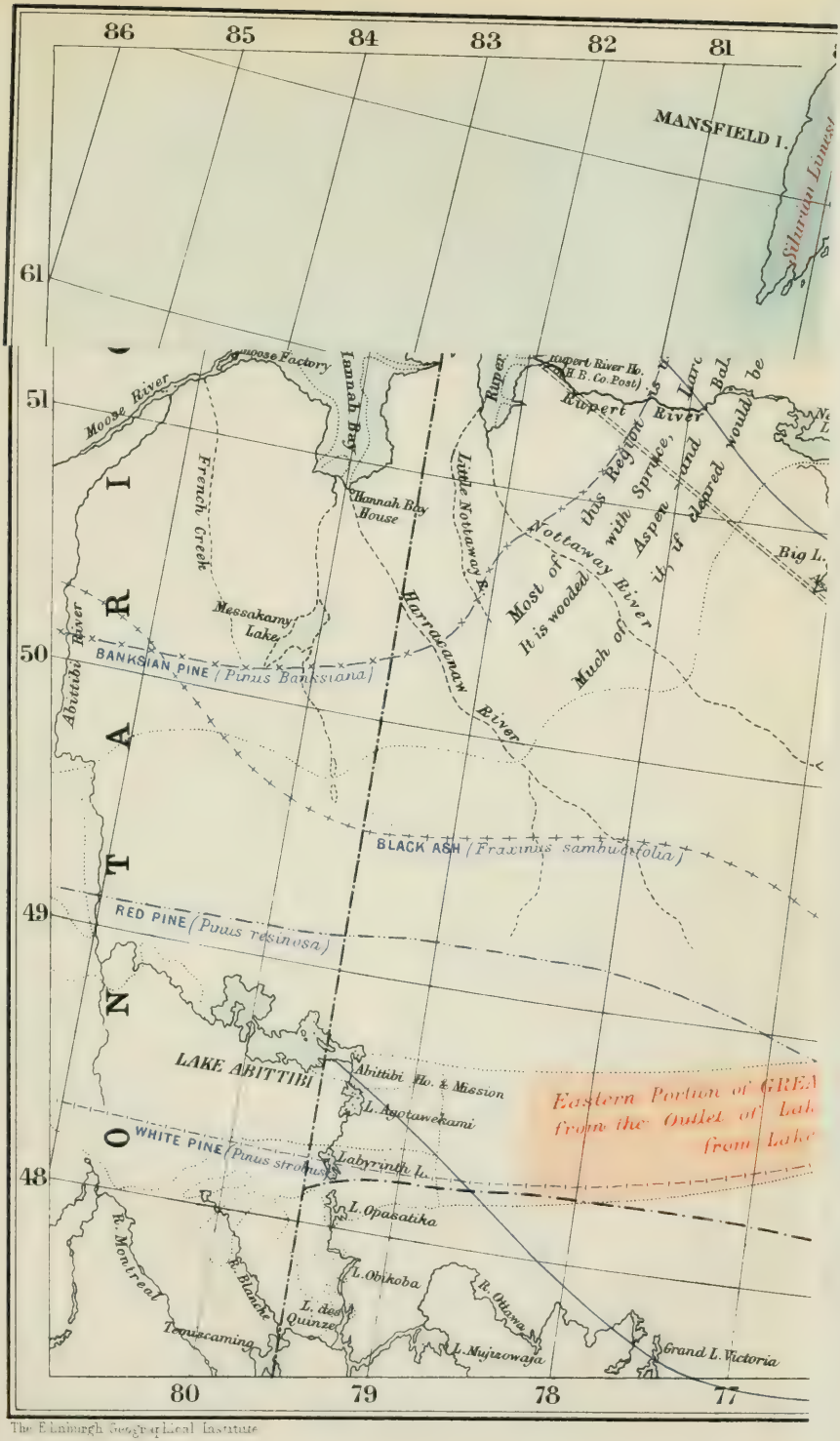
A very useful map, including the country from R. Kasar to Kismayu, and from the Haarlem lake to Cape Guardafui. The very latest discoveries of Italian explorers on the Juba and Omo are incorporated, and the names are printed on bold clear type. The colouring is perhaps a little staring. An inset map of the country between Massaua, Kassala, and Adua, on the scale 1 : 600,000, is of great interest at the present time. These two sheets should be procured by all who are interested in this part of Africa.

ATLAS.

NUOVO ATLANTE GEOGRAFICO, con 27 Carte e relativo Testo ad uso delle Scuole Techniche, Ginnasiali Normali, disegnato sotto la Direzione dell' Ingegnere Dottore Luigi Hugues da G. E. Fritzche. 14^{e} Edizione. *Price* L. 4; *Cloth*, L. 5·50.

Ditta G. B. Paravia e Comp., Torino, etc.

The twenty-seven maps which compose this collection are good and suitable for schools; some, indeed, are very effective, as, for instance, the physical map of Europe, and the maps of Italy are naturally very complete. The text which accompanies them is arranged under the numbers of the maps, which are not the same as those of the thumb index, and this is certainly inconvenient. The matter it contains is statistical and useful for reference, or rather would be, if the figures were more correct. Turning to "Isole Britanniche," we find the population of England and Wales (1891) given as 29,407,000, instead of under 27½ millions, and Scotland credited with nearly 90 thousand too many. Why should Ben Wyvis and Ben Attow be chosen to accompany Ben Nevis? and why is not Scawfell mentioned? Again, the Severn is represented as shorter than the Trent. As to the imports and exports, we are quite unable to explain how the values 8,100,000 and 4,400,000 *lire* have been obtained. Even if multiplied by a thousand, they would be too small. We will give only one more instance; under "Planiglobo" the height of Mt. St. Elias is given as 4600 mètres, and under "America" as 5900.



The Edinburgh Geographical Institute

MAP OF THE
LABRADOR PENINSULA
COMPILED FROM THE LATEST EXPLORATIONS
HUDSON STRAIT
HUDSON BAY
JAMES BAY
ATLANTIC OCEAN
NORTH EAST TERRITORY
DEPENDENCY OF NEWFOUNDLAND
QUEBEC
ONTARIO
ANTICOSTI
GULF OF ST LAWRENCE
NEW FOUNDLAND
UNEXPLORED REGION
ENGLISH BAY

SUILVEN FROM THE NORTH.

By permission of the Scottish Mountaineering Club. *By B. N. Peach.*

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE SCENERY OF SUTHERLAND.

By Henry M. Cadell, B.Sc., F.R.S.E., F.G.S.

(*With Maps and Illustrations.*)

It is a matter of common observation that the scenery and physical configuration of a country bear a close relationship to its geological structure. In districts where the rocks are soft and flat, the scenery is usually soft and flat also. The vast featureless American prairies, for example, consist of wide tracts of horizontal strata of no great hardness, and the plains and steppes of Russia are in the same way found spreading out over level formations which have been quietly and uniformly upheaved from the sea on whose floor they were originally laid down. Wherever there has been geological disturbance, however, the surface begins at once to lose its dull uniformity, and the scenery grows interesting. Many factors come into play in connection with the origin of scenery. The direction, for example, of the movements of upheaval, dislocation, or pressure, have a paramount influence on the trend of the mountain ridges, while the colour, texture, composition, and internal structure of the individual rock-masses all contribute to the character of the landscape. To return to the case of Russia, the Ural Mountains have been produced by the buckling up, along an axis running approximately north and south, of the strata occupying the plains to the west. The edges of these beds are now turned upwards, the crests of the original arches having been to a great extent worn away. Different beds having different degrees of durability, the harder ones are naturally, as time goes on, left projecting highest, while the weaker or softer strata are eroded away, forming smooth slopes or lines of valley.

It is not, however, necessary to go so far afield for illustrations of the effect of geological structure on the scenery and topographical features of

a region, as we have in the great county of Sutherland an admirable series of object lessons in this interesting department of physical geography.

The rocks of north-western Caledonia are severed geologically into two main groups by a line running from the ironbound Atlantic coast

> "Where beneath the northern skies
> Chides wild Loch Eriboll his caverns hoar,"

and thence trending southwards and westwards through the rugged mountains of Assynt and Creich into the western reaches of Ross and Inverness, and seawards

> "to that dread shore
> That sees grim Coolin rise, and hears Corriskin roar."

The part of Sutherland to the west of this line, including the districts of Assynt, Eddrachillis, and a portion of Durness, forms a belt of country from ten to fourteen miles in width. A reference to the accompanying geological map will show that this region is coloured in far more variegated tints than the larger tract of country to the east, which means, of course, that here a much greater number of rock formations occupy the surface of the country. Both geology and scenery are more interesting, as the eastern region is made up almost entirely of a single formation of metamorphic schists, most dismal and monotonous in outward appearance.

These "Eastern Schists," as they have been called, have a prevailing dip or inclination to the east, and are made up of the squeezed, stewed up, and rolled out fragments of the underlying Cambrian and older formations. The great earth movements which were instrumental in bringing about such remarkable metamorphism have much geological significance, but need not be further mentioned here.

Between Loch Eriboll and Strath Halladale, where the Eastern Schists predominate, we find a wide tract of dreary peat-covered country, with scarcely a tree, and, save where reclamations have been made by the late Duke of Sutherland, hardly a green spot to relieve its awesome desolation. The Moin, between Eriboll and the Kyle of Tongue, is, as its name implies, a long, flat, wind-swept tract of peat-moss of this sort, covered with stiff bent-grass, and without even a tuft of heather to clothe it comfortably. For an excellent example of a dismal peaty wilderness of the Eastern Schists, whose silence is broken only by the cry of the grouse, or the roar of the storm blast, a better tract could not be recommended than the neighbourhood of Forsinard at the headwaters of the Halladale and Helmsdale rivers.

In one or two cases, however, the Eastern Schists have given us exceptions in the way of scenery. Ben Hope, one of the noblest of the Sutherland mountains, amply atones for the usual scenic defects of this formation. From the south and east the appearance of this mountain is not imposing. But go to the foot of Loch Hope, and what a delightful surprise! Like a mighty pyramid, scarred down the face with deep-cut furrows, this magnificent pile is seen rising steep and bold from the shores of the loch, almost at sea-level, to a height of over

BEN HOPE FROM LOCH HOPE, NEAR ARNABOLL.

By G. Straton Ferrier, R.S.W.,
after sketch by H. M. Cadell.

3000 feet, towering in grandeur over the wastes around, and lifting its hoary brows to the northern blasts.

The accompanying illustration is reproduced from a painting by Mr. G. Straton Ferrier, R.S.W., after a sketch by the author, and in this beautiful picture, I make bold to say, that I think both the geological structure and the physical character of the mountain are most truthfully depicted. I hold myself answerable for the geology of the sketch only, and have been careful to see that half way up the face the stratified appearance produced by a thick band of hornblende and actinolite schist that traverses the mountain has been correctly delineated by the artist. As a rule, artists pay but little attention either to actinolite or any other kind of schist, but in the accompanying illustrations I hope to give examples of what I consider faithful sketches of different types of mountain scenery as viewed primarily from the geological, but also, in a more remote way perhaps, from the artistic point of view as well.

Ben Hope is undoubtedly the finest example in Sutherland of a mountain of the Eastern Schists. These rocks rise into several other more or less imposing summits, such as Meall Horn, Ben Hee, Ben Leod, Ben Clibreck, and Ben Armine, all of which are more or less rounded in form and dull grey in colour. As seen from the west and north, Clibreck (or Cleith Bric as it is also more correctly spelt in Gaelic), the second highest mountain in Sutherland, towers over Loch Naver, and the surrounding tracts of peat and bent, to a height of 3154 feet, looking more like a big dog lying on the moorland, with a plaid thrown over him, than anything else that I can think of. Ben Armine again is nothing but a collection of rounded humps, noted for very little but their extreme ugliness and want of character in the bald and treeless landscape.

In this part of Sutherland there are, however, two other rocks of younger geological age than the schists, which have important bearings on the scenery of the region. The older of these is the syenite of Ben Loyal at the head of the Kyle of Tongue. It is eruptive, having burst through the metamorphic rocks in large volumes, and now forms a knotty ridge with three rugged peaks, the highest of which—"The Castle"—is a little over 2500 feet in altitude. Although neither by any means the highest nor the most imposing mountain in the county, Ben Loyal has, I think, no equal for beauty in Sutherland. As seen from the eastern shore of the Kyle of Tongue, with the rough pebbly beach and rippling sea-waves in the foreground, and the wooded slopes of Cnoc-a-Mhuilinn and Castle Varich in mid-distance, the rugged peaks of Ben Loyal, bathed in blue haze or wrapped in fleecy cloud, form a picture of surpassing beauty. Professor Heddle, who perhaps with Mr. Colin Philip, the artist, knows our Scottish Bens better than any man alive, has described Ben Loyal as the Queen of Scottish mountains. He who has visited Tongue in September or October, when the trees are decked in their full autumn tints, and the rich brown madder hue of the bent-covered moorlands blends into the distant purples and blue greys of the mountains: he who has seen Ben Loyal under such conditions, if he has an eye for fine colour and grand outlines at all, cannot but admit that the enthusiastic professor is not far from the mark in his description of this noble

mountain. The accompanying sketch is taken from the west side of the Kyle, near Melness Ferry, where the outlines of Ben Loyal are perhaps more clearly defined, although from this point of view the surroundings have not so much artistic interest as they have on the eastern shore near the sands of Tongue.

The second formation in the east of Sutherland which is scenically important, is the Old Red Sandstone. The massive conglomerates of this formation are vastly younger than either the Eastern Schists or the eruptive rocks that pierce them, and are in fact made up to a great extent of waterworn fragments of these. Isolated remnants of the Old Red conglomerates and sandstones are found scattered over the eastern part of Sutherland in the form of what geologists call "outliers," capping the higher summits and occasionally adding spirit to the landscape. At Tongue, the Watch Hill (or Cnoc-an-Fhreacadain) is capped with a massive bed of warm-tinted conglomerate, quite different in character from the cold grey stratified-looking schists around. Another patch of small size is found on Ben Armine, but the largest mass of the conglomerate is to be seen in the extreme eastern borders of Sutherland, rising into the pyramidal summits of Ben Griam More and Ben Griam Beg, at the head of Strath Halladale. These mountains swell up steeply from a brown tract of peaty moorland, and form conspicuous landmarks from all the dreary country to the south and west. As we cross into Caithness the "Old Red" spreads out on all sides, and extends completely over what Heddle has aptly called the "land of flatness, flags, and fossil fishes," almost the only interesting feature in whose scenery is the magnificent line of sea-cliffs which bring the flatness and flags to an abrupt termination.

In the south-eastern corner of Sutherland the scenery is of a more civilised description. Much has been done to beautify it by the public-spirited Dukes of Sutherland, who have planted and cultivated the Dunrobin and Golspie coastline for generations, covering it with bosky woods that sweep for miles along the shore of the MorayFirth, imparting to it an air of comfort and rural sweetness greatly lacking in most other parts of the county.

The line which has been described as trending southwards from Loch Eriboll, and dividing the rocks of Sutherland into two main groups, marks the course of a great "thrust plane," or horizontal displacement of much geological importance, the outcrop of which generally gives rise to a great line of feature on the steeper slopes, and is indicated in a broken line on the accompanying little geological map. The Eastern Schists were once pushed westwards for long distances over the top of the old gneiss and sedimentary strata about to be described, and it was along this "thrust plane" that the greatest amount of sliding took place. The rocks below "the great thrust plane" were also much thrust together and heaped up during the progress of the movements, and this packing together has greatly influenced the appearance of the rock-masses in certain places.

Three great formations are found in the western part of Sutherland. The oldest of these is the Archæan or Old Gneiss, which spreads out in

BEN LOYAL FROM MELNESS FERRY.

By H. M. Cadell.

the form of a broad and much-worn basement, on which the younger stratified formations have been deposited. The Old Gneiss is a massive crystalline rock resembling granite in texture, but has a laminated, banded structure, and is traversed by many pink and dark dykes of basalt, granite and other igneous rocks. It is quite devoid of bedding planes, and weathers or breaks up along joints or vertical cracks which traverse it in different directions.

The scenery of the fundamental gneiss is wild and barren in the extreme. To the visitor who for the first time travels from Loch Stack to Rhiconich or Loch Inver across the Ceathramh Gharbh (or Rough Quarter), and casts his eye over the tumultuous sea of bald gneiss hummocks, this wide expanse of perfectly naked rock presents a most impressive spectacle. For many square miles in the wide parishes of Eddrachillis and Loch Inver, the Old Gneiss spreads out as a rough plateau intersected with deep furrows, and covered with knolls and ridges. The hollows—true rock-basins scooped out by old glaciers—are sprinkled with hundreds of charming lochans, whose sparkling waters, well stocked with trout, are dotted with mossy islets, and are often spangled with an abundant growth of beautiful white water-lilies. The ice sheets which polished the rock also left it strewn over with multitudes of erratics and perched boulders of all shapes and sizes. These are perhaps most abundant in the neighbourhood of Rhiconich and Loch Inchard.

As we go inland from the coast, the surface of the gneiss plateau is seen rising steeply into a ridge of lofty mountains trending southwards from the east of Durness to Spionnu, Cran Stackie, Foinaven, Arkle, and Ben Stack. Their dark and gnarled fronts rise boldly above the low ground like a line of grim ramparts frowning out on the Atlantic shores, and forming a fitting bulwark for this remote outpost of the European continent.

The Torridon Sandstone or Torridonian formation, known up till 1891 as the Cambrian, which covers the gneiss in many parts of Western Sutherland, gives rise to an entirely different type of scenery. In the Parph district between Cape Wrath and Rhiconich, it sweeps over considerable areas in comparatively low flat cakes, rarely rising into conspicuous mountains. In Assynt, however, the red Torridonian strata are much thicker, and produce many noble mountain masses. These rocks consist in Sutherland chiefly of chocolate-coloured conglomerates resting on the rough surface of the Old Gneiss, with coarse and finer grits and false-bedded sandstone beds above them. They are all distinguished by their prevailing deep red or purplish hue, and this character has sometimes led geologists to class them under the Old Red Sandstone formation, before their true age was ascertained. The conglomerates and sandstones lie nearly horizontally in regular and thick beds. The rock does not crumble down uniformly under the influence of the weather, but tends to break off along straight vertical joint planes, and thus to produce huge mural precipices where exposed along the shore, or on a mountain side. Magnificent examples of these are to be seen in Assynt round the flanks of Suilven or Quinag, or in the dizzy cliffs between Cape Wrath and Durness, one of which—the Clo More, three

miles from the lighthouse—rises from the waves to a height of 920 feet, and forms the highest sea-cliff on the mainland of Britain.

The island of Handa is entirely made up of Torridon sandstone; and on the north side of the island the ledges between the beds give shelter to vast flocks of gulls, puffins, guillemots, and other sea-birds; and a visit to Handa should be included among the things to be "done" by the traveller who wants to see all the sights of Sutherland.

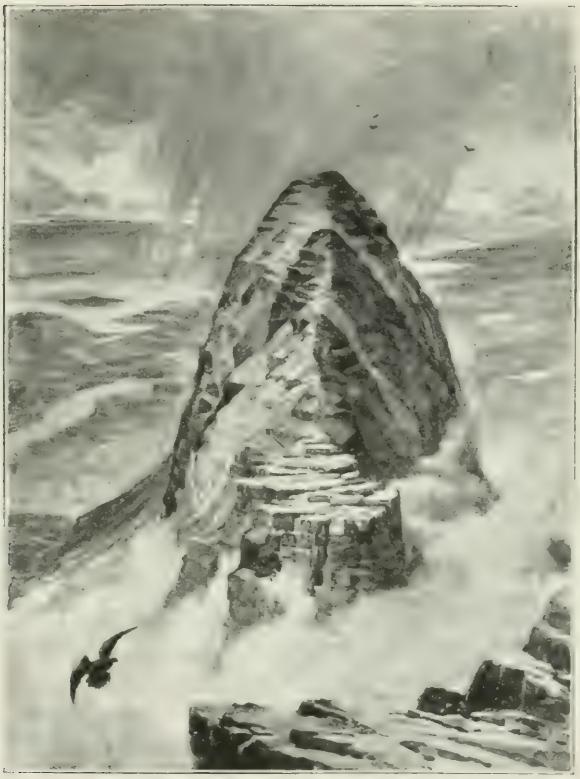
In the Assynt country the finest mountains are nearly all made up of Torridon sandstone. Quinag, Canisp, Suilven, Coul More, Coul Beg, Stack Polly, and Ben More Coigach, are built up almost entirely of massive courses of this old formation. These mountains stand like giant sentinels round the margin of a heaving sea of gneiss, or rise in buttressed pyramidal masses encircled by lofty mural precipices, and resemble at times the colossal towers of the ancients that rise amid their ruins on the plains of Babylonia:

> "Huge as the tower which builders vain
> Presumptuous piled on Shinar's plain.
> The rocky summits, split and rent,
> Form'd turret, dome, or battlement;
> Or seem'd fantastically set
> With cupola or minaret,
> Wild crests as pagod ever deck'd,
> Or mosque of Eastern architect."[1]

Perhaps the most notable of such summits is Suilven, known to sailors as the "Sugar Loaf," from its regular conical outline when viewed from the west. Suilven is really a long sharp ridge gashed by cross fissures originally caused by faults or vertical planes of fracture, which cross it at right angles and produce lines of weakness which have enabled the forces of erosion to cut it up into several distinct peaks. So sharp is the crest of the ridge that one can almost sit astride it at some places. The mountain is more conspicuous for its shape than for its height, as the highest peak is barely 2400 feet in altitude. The accompanying sketches show the form of the Suilven as seen from the west, the north side, and the top of the eastern peak respectively. In the view from Inverkirkaig, four miles off, the conical shape of the "Sugar Loaf" is, I think, tolerably faithfully depicted. The hummocky gneiss platform is seen in front; and, farther off to the left, the top of Canisp appears rising above the horizon seven miles off. In the drawing of the crest by Mr. G. Straton Ferrier, after a sketch by the author, the characteristic form of the summit is brought out on correct geological principles. I must not in honesty omit to mention, however, that, for the sake of artistic effect, the height has here been a little exaggerated—a liberty which in this case is, I think, quite excusable, as a climb along the "knife edge" conveys the impression of quite as much grandeur as the sketch is intended to bring out.

The crest of Stack Polly bristles with pinnacles produced by

[1] *Lady of the Lake.*



THE CREST OF SUILVEN FROM THE EASTERN PEAK.

By G. Straton Ferrier, R.S.W.,
after sketch by H. M. Cadell.

weathering along parallel cross joints; and Ben More Coigach is, near its western extremity, quite as sharp-topped as Suilven, and slopes steeply away like the roof of a house from its central ridge.

To see these Torridonian bens in all their glory, we must wait till the sun begins to sink towards the horizon in a long, warm summer's evening. The following truthful and glowing words from Sir Archibald Geikie's delightful work, "The Scenery of Scotland,"[1] may well conclude this part of our subject :—

"And yet, though nearly as bare as the gneiss below them, these lofty mountains are far from presenting the same aspect of barrenness. The prevailing colour of their component strata gives them a warm red hue which, even at noon, contrasts strongly with the grey of the platform of older rock. But it is at the close of the day that the contrast is seen at its height; for then, when the sun is dipping beneath the distant Hebrides, and the shadows of night have already crept over the lower grounds, the gneiss, far as we can trace its corrugated outlines, is steeped in a cold blue tint that passes away in the distance into the haze of the evening, while the sandstone mountains, towering proudly out of the gathering twilight, catch on their giant sides the full flush of sunset. Their own warm hue is thus heightened by the mingling crimson and gold of the western sky; and their summits wreathed, perhaps, with rosy mist, glow again as if they were parts, not of the earth, but of the heaven above them."

The third and last of the great geological formations of Sutherland is the Cambrian (formerly classified as the Silurian), and here we meet with a series of strata whose distinctive colour and form produce mountains of still another character.

Resting sometimes on the Old Gneiss and sometimes on the Torridon Sandstones, the white Cambrian quartzite is easily distinguished from the more sombre rocks beneath it. The quartzite occurs in a thick bed of great regularity, which can be traced almost continuously from Loch Eriboll to Coigach, and thence on through the Dundonell Forest to Kinlochewe and Loch Carron. It forms on the map but a narrow strip running parallel more or less to the line of the Great Thrust. Its normal thickness in Sutherland is 500 to 600 feet, but in the thrust region it has been so packed together that it has often a much greater apparent depth. Where undisturbed, its edges are seen capping the tops of the hills in long lines of light grey escarpment almost like the walls of some ancient fortification. On the western shores of Loch Eriboll it spreads as a thin cake over the gneiss ridge of Spionnu and Cran Stackie, forming a smooth and barren slope whose hard and close-grained surface has been splendidly polished and striated by the glaciers that once filled the valley. Perhaps the most magnificent example of the quartzite is to be found along Strath Dionard and the crests of Foinaven and Arkle, between the head of Loch Eriboll and Loch Stack, where it has been packed together and thrust into a great heap, as one might sweep up a pack of cards spread out on a table. The weird precipices round the Plat Reidh at the head of Strath Dionard show the successive thrust planes to perfection;

[1] Second Edition, p. 202.

and to the spectator on the road past Loch Stack a splendid view is displayed of Arkle, a mountain 2600 feet in height, the upper part of which is entirely composed of piled-up beds of white quartzite. It is here seen in magnificent cliff section, rising on the opposite side of the loch, tier above tier, on the back of a huge gnarled wedge of gneiss, like some colossal pile of Titanic masonry crumbling in ruins, and bestrewing its dark pedestal with the whitened products of its own decay.

The quartzite breaks up into angular blocks and sharp chippy fragments which characterise the scenery by the long screes or talus slopes they always produce, and are very trying to the boot leather of any one who seeks to climb them. This tendency to crumble often gives the summits of the quartzite mountains a rounded form. The rock is almost entirely made up of pure quartz or silica, and where it predominates the ground remains perfectly barren and devoid of soil and vegetation. The crests of the quartzite peaks, with their long white screes, resemble to my mind, in many cases, the smooth bald head of some venerable patriarch, whose fringe of snowy locks descends in streams far down his rounded back and shoulders.

From an artistic point of view the quartzite has but little to recommend it, and however interesting it may be to the geologist, it presents neither the rich warm colouring nor the structural features which give so much scenic interest to the Torridonian rocks of Sutherland.

The quartzite was originally covered with a comparatively thin bed of brown shale, which has recently become celebrated as being the home of *Olenellus* and other interesting fossils of Cambrian age. Wherever the *Olenellus* shale crops out, a bright green streak of vegetation is found flourishing on the good soil into which it crumbles. These oases in the grey deserts of the quartzite plateaus occur at intervals all along the line of the Cambrian outcrops, and the fresh vegetation that clothes them enables the shales to be recognised at a glance, and affords better grazing for the sheep and deer than is found on almost any other rock in the region.

The highest and thickest member of the Cambrian formation in Sutherland is the great fossiliferous limestone of Durness and Assynt. The Durness limestone is over 1500 feet thick, but it never rises into prominent mountains, and has consequently but little scenic importance in Sutherland. It is most conspicuous in the vicinity of Inchnadamff in Assynt, where it has been packed together like the quartzite, and forms the prominent plateau of Stronchrubie surrounded by steep and noble cliffs. The limestone beds are grey in colour, and wherever they predominate their decay produces good and comparatively fertile land, which can be cultivated with some chances of success. Unfortunately for the farmer, the limestone districts are of very limited extent, and, beyond the blue patches shown on the map at Eriboll, Durness, and Assynt, there are no other places where the rock covers any considerable area of ground in Sutherland.

To turn from the mountains to some of the other physical features of Sutherland, we may look briefly at its lakes and valleys. The orographical map shows the general lie of the land. The watershed corre-

SUILVEN FROM INVERKIRKAIG, SHOWING THE SUMMIT OF CANISP AND PLATFORM OF THE OLD GNEISS IN FRONT.

By H. M. Cadell.

sponds roughly in direction with the great displacement, and lies a little to the east of it. The long sloping plateau of the eastern schists is traversed by the valleys of the Oykell, the Shin, and the Helmsdale rivers, which drain into the North Sea, and by the Naver and the Halladale, which find their way into the North Atlantic. Most of these straths are comparatively tame for the greater part of their course. Loch Shin, which runs for some 16 miles along the principal depression, is a bare and most uninteresting sheet of water lying in the bottom of what has been compared to a huge gutter, with neither tree nor crag to relieve its dull monotony. Loch Naver is a great improvement on Loch Shin, stretching as it does from the foot of Ben Clibreck to the head of "bonnie Strathnaver." The beauty of this strath in particular never impressed me very much, it must be confessed, and the person who first gave it this name must have been best acquainted with ugly places, and rather hard up for information about the rest of the county.

He who wants to find beautiful fiords and valleys should visit the Kyle of Tongue, Strath Hope, Strath Beg, at the head of Loch Eriboll, or the glens of Loch More, Loch Kylesku, and Loch Assynt; but if deep gloom and awesome desolation are preferred, commend me to the remote and weird recesses of Strath Dionard at the back of Foinaven,

> "Where rocks were rudely heap'd, and rent
> As by a spirit turbulent;
> Where sights were rough, and sounds were wild,
> And everything unreconciled;
> In some complaining dim retreat,
> For fear and melancholy meet."

The most beautiful journey in Sutherland is, I think, the drive from Inchnadamff to Scourie along the charming and verdant shores of Loch Assynt. The old castle of Ardvreck and the ruined walls of Calda House, here add to the scene an element of life and human interest which is sadly lacking in much of the scenery of Sutherland. The fragrant birken slopes and grassy banks below the grand precipices of Spidean Coinich help also to relieve the overpowering sense of rockiness which, although abundantly fitted to inspire awe and admiration, also conveys a sense of fear, depression, and lifeless desolation, instead of the happiness and love that should mingle as a component element in every truly pleasing landscape.

THE NILE RESERVOIRS.

By H. D. Pearsall, Assoc. M. Inst. C.E., M. Am. Inst. M.E.

The heat of controversy over Philæ having subsided, the humours of the contest begin to be generally appreciated, and it may even be possible to obtain a hearing for other aspects of the question, about which little was heard while the *sapeurs*, to whom it is said nothing is sacred, and the

archæologists, to whom every ancient idol is more sacred than if they believed in its divinity, were tickling the public ear with epigrams. As both parties to the dispute were modern men of science, it is disheartening to perceive that the old Adam was stronger on both sides than the scientific spirit. The archæologists, not content with showing the scientific value of the ruins, backed their demands by appeals, which were truly comical, not to sacrifice the mud villages (dignified for the occasion by the name of towns and compared with the city of Oxford!) of Nubian peasants, whose condition would very clearly be immensely improved, instead of being sacrificed, by the proposed works; and even condescended to allege that the Egyptian Government proposed no compensation for disturbance, although large sums for this purpose formed part of the estimate for every scheme.

But the engineers were hardly behindhand in representing the question as merely that of "one temple more or less," and, jokingly (surely), suggesting that ignorant wonder at a feat of house-lifting would immensely add to the interest of "intellectual" tourists.

These, however, were merely the humours of the controversy into which the heat of argument led able men. The real facts were no doubt more accurately appreciated by both sides than their polemical arguments indicated, and perusal of the voluminous documents published by the Government of Egypt clearly shows that their engineers had weighed and considered with great caution all the solid arguments on both sides, and that charges of a spirit of Vandalism against them are ridiculously undeserved.

The principal temple is to be preserved as a thing of beauty by a great reduction in the level of the surface of the reservoir. Archæological interests are respected not only by thus keeping many of the ruins unsubmerged, but by the devotion of a handsome sum to an archæological survey of those ruins which will be submerged.[1]

The enterprise and its object itself may be described in a very few words.

Nearly the whole of Lower Egypt is under a system of perennial irrigation, by means of which two crops are raised each year, and even, on some lands, three crops. In Upper Egypt, on the contrary, only one-fourth of the land has perennial irrigation, the rest being irrigated only during flood, and raising therefore but one crop per year.

The difference between perennial and merely flood irrigation is, however, not only the difference between one crop and two, but the second or summer crop is by far the most valuable, averaging £10 per acre against £3 to £3 10s. for flood and winter crops.

The objects aimed at in the proposed reservoirs were three:—

The first was the extension of the perennial irrigation of Lower Egypt to Upper Egypt. The estimated gain in annual produce which would be obtained by this change was about 4 millions sterling.

A second object was to make the system of perennial irrigation

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[1] The archæological point of view is set forth by the Society for the Preservation of the Monuments of Ancient Egypt in *Reservoirs of the Valley of the Nile.*

already existing in Lower Egypt more secure, as at present, in years of low Nile, the summer supply is scanty and insufficient. The estimated value of this insurance was £250,000.

A third object was the reclamation of land in the delta which is now swamp or salted plains. The estimated value of this reclamation was £1,800,000 per annum.

A perennial system of irrigation with a sufficient supply of water at all times will also greatly increase the food supply of the country by lending itself to pisciculture.

These figures are those of Mr. Willcocks, the engineer, who was charged with the study of the reservoir question by the Government of Egypt.[1] It appears to be probable that they understate the increase of produce. Much more detailed estimates have also been published by the Government on the authority of Major Brown, R.E., and Mr. Foster, Inspectors-General of Irrigation, and are accepted as reliable by the Secretary of State, P.W.D. According to these figures the increased annual produce to be expected amounts to 12½ millions sterling, if the complete scheme for Upper and Lower Egypt be carried out.

The estimated cost of the reservoir and subsidiary works required to produce this return, as finally approved by the European Technical Commission, was £5,000,000. This estimate must be allowed to be among the most reliable, as the original estimate of the very capable Government engineer has been examined in detail by three independent engineers of the largest experience in such work.

It seems, therefore, on the face of these facts, to be most obviously work worth doing, and it would certainly have needed most weighty considerations to have justified the Egyptian Government in leaving it undone.

The Government therefore concluded rightly that the work ought to be done.

There appeared, however, to the Government engineers to be three or four possible ways of accomplishing the above objects, and in some of the statements and estimates published by them it even appeared that there was not very much to be said in favour of any one over the others.

The case, however, appears very differently in their final report, after re-examination of all the projects in consultation with Sir B. Baker, Signor Torricelli, and M. Boulé. Mr. Garstin, Under-Secretary of State for the Public Works Department, in his report of 17th May 1894, expressly says that, although he had thought and hoped that there were other sites for the reservoir as good as that at Assouan, he believes it to be now clearly proved that this is not the case, and that practically the Assouan is the only feasible site.

This is not a question merely of expense, as it has been represented. It is mainly a question of security. The alternative sites for dams in the Nile valley are at Silsila and Kalabcha.

The former is absolutely rejected by Sir B. Baker and Signor Torri-

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[1] *Report on Perennial Irrigation and Flood Protection for Egypt.* By W. Willcocks, M.I.C.E.

celli as being dangerous on account of affording no foundation except sand with layers of clay.

The Kalabcha site they reject primarily on the ground of its great cost; but this cost is not that of the estimates which are before the public. These estimates the engineers are now agreed in regarding as quite inadequate, as the methods of construction on which they were based were condemned on reconsideration as impracticable. No detailed estimates have been published of the probable expense of constructing this dam in the only way in which it could be constructed. But although this site is rejected primarily on account of its great expense, it is clear also that it is not regarded by the eminent engineers responsible for the work as entitled to the same confidence in its security as the Assouan dam. It is true that the French Commissioner, M. Boulé, maintained that it was possible to construct a dam which shall be secure in almost any locality, and this is no doubt theoretically correct if no limit whatever be put to the expense incurred. But he did not attempt any detailed sketch of a dam which he would consider absolutely safe, and still less any estimate of its cost, and it is certain that practically, with even a large expenditure, the security of either a Silsila or a Kalabcha dam will be less than that of one at Assouan, so that his opinion really leads very nearly to the same conclusion as that of the other engineers.

The public will certainly not find fault with the Government of Egypt for insisting, as a primary condition, on the greatest practicable degree of security and permanence. The collapse of large dams is unfortunately an event rather familiar, and is sufficient ground for preferring a site which has all the natural conditions of stability, however recklessly colossal we may be content to construct the artificial works on an alternative site to make up for want of these.

There is, indeed, more justification for this view than the public is aware of. In the long list of failures of dams, bad foundations are conspicuous as the chief cause, whereas there is hardly an instance of the failure of a dam of the character of that now to be built at Assouan.

In the original report of Mr. Willcocks, a fourth site for a dam was discussed just above the island of Philæ. The objection to this was of precisely the same kind, viz., rock unsuited for foundation on a part of the line of the dam. In Mr. Garstin's report, however, he speaks of making further excavations to determine this more certainly.

Whether this was done or not, there is nothing in the official report to show, but presumably, if so, the result was as anticipated, as this site is not even discussed by the members of the Technical Commission.

Besides alternative sites in the Nile valley, another project was studied by the Government of Egypt for converting into a reservoir a depression in the desert forty miles south-west of Cairo, known as the Wadi Rayan. This project obtained a great hold on the popular imagination, partly on account of the enthusiastic advocacy of Mr. Cope Whitehouse, and partly because of the idea that the Wadi Rayan, or a similar reservoir, was the ancient Lake Mœris which Herodotus and Pliny said had been artificially excavated for this very purpose.

Even in these progressive days we still believe in the wisdom of the ancients, and this old myth, transmitted to us by an author of 2300 years ago, has clearly had a good deal of weight with the British public of to-day. But a very little reflection must show that the legend was absurd, for there could have been no possible object in excavating a reservoir more than 150 feet below the level of the lowest adjoining land. The depression is therefore clearly a natural one, and this is now known to be the case by geological investigation.

But though the ancients did not dig such a reservoir, they no doubt did use a natural depression similar to the Wadi Rayan in very much the way in which Mr. Cope Whitehouse urges the Government of Egypt to use it, and the Government of Egypt has very carefully studied the question.

In the first place, it is evidently not a *substitute* for the dam proposed by Mr. Willcocks in the Nile valley—for it could only be of use to Lower Egypt, and therefore at the utmost could only secure about one-third of the advantages expected from the Assouan dam. Even of this there is grave doubt, as in case of delay in the rise of the Nile there would be danger of insufficient water to complete irrigation.

In the second place, its cost is estimated to be even more than that of adequate works for supplying both Upper and Lower Egypt.

In the third place, the percolation into adjoining lands is regarded as likely to endanger the cultivation there.

These reasons seem to be fully adequate for abandoning this project.

The figures given above for the advantages expected from the reservoir at Assouan are those of the project as formulated by Mr. Willcocks and Mr. Garstin.

Before the report of the Technical Commission, however, it had been decided to postpone the part of the project referring to Egypt south of Assiout, on account of some uncertainty as to the effect on the flood-level of the river of abandoning the use of the basins there, and as to the possibility of adequate drainage. This of course meant the abandonment of part of the increased produce mentioned above, but in the memorandum of Mr Garstin of December 1893 he regarded this as a temporary postponement and not a permanent abandonment.

The Egyptian Government had, however, still to come to a definite decision. The answer to the technical question was clear. But what about the ruins?

They seem to have come to the conclusion that the ruins must be saved at all costs, and, by a resolution of the Ministry of 8th November last, they propose to do this by building the dam at Assouan, but so much lower than formerly proposed that the principal remains on the island of Philæ will not be submerged. Some of the smaller monuments will still be below water-level, and these it is proposed to protect by special works. Of course this reduction of the size of the dam will somewhat reduce its cost; but as the cost of the dam as originally projected was insignificant in proportion to the advantages expected from it, this is a matter of little or no importance.

But its effect on the resulting improvements is very great indeed. In

the note embodying this final decision, Mr. Garstin says that the smaller dam will only retain sufficient water for *either* Middle or Lower Egypt,—and which of these is to receive preference is not yet decided. Mr. Foster's estimate of the gain to Lower Egypt was £4,000,000 per annum, and Major Brown's estimate for Middle Egypt was £4,500,000, so that it appears that in either case some £4,000,000 sterling per annum is to be sacrificed.

With the crest of the dam at 118 metres R.L. (viz., the original project of Mr. Willcocks), the reservoir was estimated to hold 3700 million cubic mètres, which was just sufficient for the whole of Egypt north of the dam. For Lower and Middle Egypt 2550 million cubic mètres would suffice, and this would be retained by a dam at 114 mètres R.L. The level is now to be only 106 mètres, and the contents 1000 million cubic mètres.

This is such an immense reduction from the original plan that it must be regarded as its practical abandonment, and, instead of a scheme providing adequate irrigation for the whole of Egypt, what is now contemplated is only a comparatively small project for the improvement of a few provinces.

It is therefore a very serious question whether the Government of Egypt have used their power rightly in coming to this decision. Is there any reasonable probability that the value to the peasants of Egypt of not submerging Philæ will be several millions sterling per annum? And surely this was the question before the Government as trustees for the people.

But even in the interest of that vague thing called civilisation, is it not more probable that the thorough search and survey of all ancient remains on the site of the reservoir, for which the Government of Egypt had set apart £50,000, and were willing to grant still more, and for which they had seven years' time, would have yielded immensely more treasures to archæological science than the mere perpetuation of the remains, subject to the incessant depredations of natives and dealers which is now going on?

No doubt, by this decision of the Government, Egypt is not deprived of the contemplated advantage for ever. At some future time other reservoirs will almost certainly be constructed higher up the river. But that is not feasible until the Egyptian frontier is moved further to the south; and no detailed surveys have yet been made, and no certain knowledge has yet been obtained as to what reservoirs are practicable there, and at what cost.

We have given an account as brief as may be of the technical sides of this question, partly for the sake of leaving some space to refer to another side of it of certainly not less importance.

In the above summary, the advantages of the proposed works are estimated in the increased produce expected. But the real object which interests the Government of Egypt and the British people is the prosperity of the people of Egypt. Is that the same thing?

Public opinion would certainly be very debased if it could devote absorbing attention to the technical question of the cheapest reservoir,

and take no interest in tracing its effect on the people of Egypt, and therefore we should expect a quite equal attention to this part of the subject.

Moreover, if Great Britain is morally responsible that works carried out there during the occupation shall be the technically best, she is morally responsible in a still stronger degree for arrangements affecting the distribution of the benefits of such works; nor could any intelligent Englishman or Scotchman be content that the result of our great work in Egypt, perhaps to be a monument of our occupation for all time, should be a factitious instead of real prosperity to the people we have taken under our protection.

With many people it would some years ago have been treated as an axiom that increased produce means increased prosperity, but that superficial view is now exploded. It does not necessarily follow, and indeed is probably not the case, that if the produce of every acre of land in England were doubled, the mass of the population would therefore be any better off. It is nearly certain that almost the whole of the increased produce would enrich only the comparatively few Englishmen who are landowners. In fact, the question, whether increased productiveness of land increases the prosperity of the inhabitants as a whole, must depend in the first place on the nature of the land tenure, and, secondly, on the way in which the finance of the improvements is managed.

As regards the system of land tenure in Egypt, the landholding class is very much larger than with us, but the inequalities are almost as great, and the class who hold no land is estimated by some competent authorities to be more than half the population.

It is not easy to see how increase of produce on the land will benefit this half of the population, unless by special arrangement to that end; and not only that, but without special arrangement the lion's share of the benefit will also be absorbed by the largest landholders.

But if we are in Egypt as trustees for the people of Egypt, it is certainly as trustees for the whole people, and we must be careful not to give away the heritage of the poor to the rich. And are not the unused waters of the Nile especially the heritage of the poor?

Whether the working population of a country has any right to the natural resources of the country may be a question in those cases where those resources have been already developed by other hands, but where *undeveloped* resources exist they surely should be regarded as *equally* the right and property of *all* the people of the country, for what more right has one man than another? Therefore when they come to be developed, it is most vital that it should be under such conditions as will secure to *all* the people, and especially to the poor, the use of their property.

If the greater part of the benefits of this immense improvement of the great natural resources of Egypt is allowed to be monopolised by the few, we shall absolutely wrong the people of Egypt. This at least should therefore be prevented, and it would certainly seem that if it be, we shall have a grand opportunity, with several millions per annum of *new* wealth, to enormously increase the prosperity

of the whole people. To these general principles probably no one will object, but much more than this is needed. It is a case where the distribution of the wealth to be created is of even more importance than its creation. The carrying out of the principle in practice should therefore surely be a condition *sine quâ non* of any scheme for further developing the resources of Egypt. It is not a mere matter of charity but of justice. It would be infinitely better, because juster and wiser, to defer further development than to develop solely for the benefit of the few, for that would be endowing them with the just heritage of the many, and taking from the latter, if not any immediate benefit, yet potential benefit of great value.

It appears that the revenue survey of Egypt is still unmade. It will almost certainly be impossible to fairly distribute the new wealth without such a survey. Therefore, if the seven years required to build the dam is not sufficient for this work also, delay in commencement of the construction is by no means to be regretted.

Most monstrous inequalities in land taxation, usually in the direction of injustice to the poor and favour to the rich, existed before the occupation. For ten years the Government of Egypt has been making strenuous efforts to approximately equalise burdens; but the inequalities still admittedly exist in innumerable cases. Let us, at least, not add to these inequalities. May not the distribution of the new wealth even be used to assist in reducing them?

We have, however, searched the Government Reports in vain for any recognition of the importance of this part of the question. The increase of revenue is discussed by Major Brown, Mr. Foster, and the Under-Secretary of State, and estimated at £850,000 for the whole of the original scheme. As regards the remaining £11,000,000 per annum, it appears to be accepted as a matter of course, as stated by Major Brown, that "the profit is to the landowners and cultivators." Is there, however, any ground for assuming that the profit is to the cultivators? Is it not rather obvious that those of them who are not landholders are unlikely to receive any share in it? Major Brown himself estimates the increase of rent as about one half of the increased produce, and assuming that the other half is represented by additional labour required by the additional crops (for it must be remembered that the increased produce is mainly due to growth of a second crop on the same land), these estimates themselves contemplate the monopoly of benefit by the rent receivers to the exclusion of the rent payers. But whether this is the basis of Major Brown's calculation or not, we know from universal experience that eventually, if not immediately, rent will always rise to almost the full equivalent of any improvement in land, so that the eventual exclusion of the mere cultivators from any benefit is certain. It appears also to be assumed as a matter of course that any tax assessed will vary only with the nature of the improvement bestowed on the land, and in this case not only will the landless receive no benefit, but the small landholders will receive only a small benefit, and the bulk of it will go to the large landholders.

It is no doubt true that any attempt to distribute this stream of

wealth with equality and justice is beset with difficulty. It is quite probable that it is impossible without a comprehensive survey of the whole land system, and that this may require considerable time. But surely delay is better than injustice. With increased wealth amounting to many millions per annum to dispose of, surely the question of how it is disposed of is of surpassing importance, and no plea of ignorance or difficulty can be accepted as sufficient for shirking it.

The general principles on which a fair distribution among the people of Egypt can be assured do not seem very far to seek, though any brief statement of them must necessarily appear crude by the necessity of brevity. At least, however, no new vested interests must be created, as it were accidentally and as a matter of course. It must not be an axiom that if the holder of 20 acres pays a new tax of £1 per acre for the improved water supply he may get from the new works, that therefore the holder of 1000 acres similarly situated and similarly benefited should also pay but £1 per acre. The contrary should indeed be an axiom, or the 1000 acre man will, of course, secure 50 times the share of benefit of the 20 acre man. Such an extension of the principle of giving to him who hath is surely in these days utterly inadmissible. There is clearly no private property in the undeveloped Nile. It is the common property of the country. Therefore, how can any one man fairly demand a fifty-fold greater share of it than another? The principle should clearly be that the benefit conferred on the 20 acre man should be the same, as nearly as may be, as that conferred on the 1000 acre man.

But even if all landholders thus receive equal treatment, the Nile reservoir would enrich only the landholders, and the landless class would have no share in the new Pactolus. As this class embraces half or more than half of the fellaheen, such a result would be a manifest injustice of the gravest kind. It is true that so far as the new source of revenue diminishes existing taxation all classes will probably gain, and the landless class among others. But the new taxes as proposed by the Government are, as we have seen, only about $\frac{1}{14}$th of the estimated increased produce, so that if existing taxation were reduced by the whole amount of the new tax, and the whole of the reduction were on taxes now paid by the landless class, they would still receive very much less than their reasonable share of the new wealth. But such a relief is manifestly impossible, and actually there are very few taxes a diminution in which would directly improve the condition of the landless fellaheen.

Is it impossible, then, to distribute any of this stream of wealth to those who most need it? Is it a law of nature that to those who have nothing nothing can be given, and that we must even necessarily take away even that which they have, viz., their inheritance in the future?

Most assuredly this is not so; but to devise ways in which this iniquity can be avoided will demand efforts of statesmanship perhaps greater than any of the other problems connected with this development of the resources of Egypt.

During the heated discussion about Philæ, some of the archæologists accused the Government of Egypt that their care was solely to improve the position of the bondholders by increasing the revenue and to further

enrich the already favoured large landholders of Egypt. The improvement in the position of the peasantry already effected proves that this is a libel on our representatives. The abolition of taxes on sheep and goats, and on trades and crafts, the reduction of the salt tax by 40 per cent., the abolition of the corvée—all show a lively and intelligent interest in the poorest of the population on the part of the Government.

But we sometimes see benevolent and just reforms of this kind carried out side by side with financial arrangements which produce the very poverty that the reforms can only alleviate. It is very much to be hoped that the Government of Egypt will not give us a glaring modern instance of this on a large scale. Amidst the clamour of vested interests by which they are surrounded it will not be easy to avoid it, but it is essential both to their honour and ours.

The English officials in Egypt are necessarily subject to the disadvantage of prolonged absence from Europe, and must be more or less out of the current of modern thought; but the condition of the common people is everywhere being recognised to-day as the really important question of government and the true gauge of the real prosperity of every country. It is admitted that poverty is the present lot of the mass of the Egyptians as of that of most other countries. With such a large stream of new wealth to be poured into the country by the hands of the leaders of civilisation, as we claim to be, shall we be content to use it so as to merely perpetuate their condition of poverty and dependence?

THE PEOPLE OF TIBET.[1]

THE word Tibet represents two Tibetan words meaning "Upper Bod," and is occasionally used by the natives to distinguish the central and western portions of the country from the eastern portion, or "Lower Bod." Of the meaning of the word Bod several explanations have been given, the most generally accepted derivation being from the verb *bodpa*, "to speak." However this may be, it is certain that Tibetans from all parts of the country call themselves Bod-pa, with some variations in pronunciation. The name Tibet first occurs in the Arab Istakhri's works (about 590 A.D.) under the form Tobbat, and is found in Plano Carpini's *Historia Mongalorum* (A.D. 1247) in the form Thabet; Marco Polo uses the form Tebet.

Tangut is simply the Mongolian appellation for Tibet, and is misleading as applied to a certain section of the country by some European writers, for the people dwelling there are pure Tibetans.

Roughly speaking, Tibet may be defined as that part of Central Asia lying between the 76th and 102nd meridians of E. long. and the parallels of 28° and 36° N. lat. With the exception of its extreme

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[1] Extracted from *Notes on the Ethnology of Tibet, based on the Collections in the U.S. National Museum*, by W. W. Rockhill (*Report of the U.S. National Museum*, 1893).

western, south-western, and southern portions, it forms an integral part of the Chinese Empire. M. Reclus, including the Koko-nor region and other Tibetan-speaking countries on the west and south, estimates its area at about 770,000 square miles.

Philologically, the Tibetans belong to the same linguistic family as the Burmese. Little information can be gleaned of their origin from their national records, and the earliest notice of them from Chinese sources dates from the eighth century A.D., when the Chinese came into contact with Tibetan tribes in the north-east corner of the country and in the west of Sze-chuen and Kan-su. Here are still to be found the purest specimens of the type, and everything points to the north-eastern section of the country, somewhere near the Koko-nor, as the early home of the Tibetans, whither they probably migrated, as may be gathered from the Chinese annals, from the east.

Some light is thrown on the growth of the country and its progress in civilisation by Tibetan historical works. From the *Book of Kings*, a work, indeed, of modern origin, and compiled under Chinese influence, we learn that in the second century A.D. charcoal was first made, ores extracted, and irrigation introduced; that in the fifth century fields were fenced in, skin garments were first made, and water was stored in reservoirs. Rapid strides were made in the seventh century, when Srong-tsan-gambo was on the throne, and under his rule Tibet became an aggressive country and attacked all its neighbours. It was then that an alphabet of thirty consonants was devised, based chiefly on the *nagari* in use at the time in Kashmir. With the Nepalese consort, whom the King took to himself, Buddhism became the State religion, several ceremonies and customs pertaining to the native *Bönbo* religion being retained. Chinese customs and inventions came into the country with the Chinese princess whom Srong-tsan-gambo married about 635 A.D. The manufacture of rice-wine and barley-wine, of butter and cheese, became known in Tibet, the people learned how to make pottery, and water-mills and looms were introduced.

But more important to the culture of the country than any other influence was the rapid spread of Buddhist missionaries from Nepal, Kashmir, and China. During the reign of Gung-srong-du-je, grandson of Srong-tsan-gambo, tea was introduced from China, and earrings and new modes of hairdressing were brought from India. A little later works on astronomy and astrology, medicine and surgery were translated from Sanscrit and Chinese into the stilted artificial literary Tibetan, which grew up after the introduction of the alphabet and the adoption of Buddhism as the religion of the country.

Though from this period Chinese and native works fail to throw any light on the history of Tibet, they have shown that the present civilisation is borrowed from China, India, and possibly Turkestan, and that only the simple arts of the pastoral nomad are of Tibetan origin. And this conclusion is fully confirmed by an examination of the Tibetan collections in the U.S. National Museum, when compared with the productions of the neighbouring countries on the eastern and southern borders.

Tibet falls naturally into three parts, according to the altitude of the country and the trend of the valleys. The first division consists of the northern plateaus, extending from 80° to 92° E. long., and from 30° to 36° N. lat., which have an average altitude of over 15,000 feet above sea-level, and are thinly peopled by semi-nomadic pastoral tribes called Drupa (Hbrog-pa). To the south of these, and on their eastern edge, valleys trend in an easterly direction for a few hundred miles, with a minimum elevation of 10,000 feet. Lastly, in the eastern portion of the country, there are valleys running approximately north and south, which descend as low as 6000 feet above sea-level. In the last two divisions permanent habitations and cultivation are found up to an average height of 13,500 feet, approximately the upper limit of forest in this latitude. The valleys of the eastern part of the third division, running north and south, admit the moisture-laden clouds of the south-west monsoon, and hence the country round Koko-nor, and to the south-west of it, has probably a much heavier rainfall than any other part of Tibet, and the valley bottoms are more fertile than those skirting the northern slope of the Himalayas. These natural conditions have exercised a marked influence on the population of the different divisions and their degree of culture.

The people, except in the extreme east and north-east, are essentially of the same race, the purest representatives of the stock being found among the Drupa already mentioned. This primitive type is greatly modified in those districts where there are permanent settlements, becoming more Chinese towards the eastern frontier, and more Indian (Nepalese and Kashmiri) on the south and west. The custom of foreign traders, pilgrims, officials, etc. leaving their wives behind and taking native concubines, fully accounts for this alteration in the primitive type in a small population of probably not more than 300,000, where the principal centres of population have for several centuries been inhabited by foreigners.

Among the Drupa Tibetans the men measure about 5 feet 5 inches, and the women are not appreciably less. The head is brachycephalic, the hair, when worn, almost always wavy, and the eyes light brown. The nose is thick, sometimes depressed at the root, sometimes high and even aquiline, but usually narrow, though the nostrils are broad. The cheek-bones are high, but not as prominent as with the Mongols. The mouth is broad, and the lips not very full—among the people of the lower districts decidedly thin. The beard is thin, and is plucked out with tweezers, except the moustache, which is sometimes worn, especially in Central Tibet. The shoulders are broad, the legs not well developed, the feet large, and the hands coarse.

The women are usually stouter than the men, and have fuller faces. Many have no children, and large families are not common. The women are perhaps stronger than the men, as they are obliged to work hard from their childhood. Their hair is long and coarse, but not very thick; it is only in extreme old age that it becomes mixed with a little white. Men with white hair are also very seldom met with.

The skin of the Tibetans is coarse and greasy. Its colour is light-

brown, often nearly white, but where exposed to the weather it is tanned nearly to the colour of an American Indian. Rosy cheeks are common among the younger women. The voice is powerful and the hearing acute. The sight is not remarkably sharp, and blindness, generally due to cataract, is rather common, as well as ophthalmia, attributable in great measure to the rare use of hats and the pungent smoke of the dwellings.

The Tibetans can endure exposure to cold without any apparent inconvenience. They never take a hearty meal, but stave off continually the pangs of hunger by eating a little when they drink their tea. They cannot, owing to the nature of their food, abstain entirely for any length of time, but they can travel for long periods on starvation rations. The average length of life is not much shorter in Tibet than among the Mongols, though certainly less than among the Chinese. Aged men are seldom seen, and a man of seventy is considered very old.

Father Horacio della Penna, a missionary of the eighteenth century, and the well-known Father Desgodins speak very unfavourably of the character of the Tibetans, describing them as cruel and vindictive, treacherous, avaricious, and addicted to intoxication; whereas Captain Turner alleges them to be humane and gentle, obliging and respectful. Mr. Rockhill, whose intercourse with them extended over six years, believes the Tibetans to be kind-hearted, affectionate, and law-abiding, and is inclined to think that the most objectionable traits in their character appear only in their intercourse with foreigners, whom they instinctively fear and distrust.

As regards social organisation, the knowledge of Tibetan society obtained up to the present is too scanty to furnish data for a full and reliable sketch. As far as Mr. Rockhill could ascertain during his residence among the Drupa, the members of a clan have no family names except that of the chief or clan. A man may marry a woman of the same tribal name or of another, but not a relative, within at least three degrees. The looseness of the marriage connection, the habit of never addressing a person by his name, and the reluctance of the people to speak of their families, make inquiries into the subject extremely difficult. The fact that both polyandry and polygamy obtain in Tibet adds wonderfully to the confusion of family relationship.

In the more highly civilised districts of Tibet there is no trace of family or tribal organisation, or of caste. Certain families who have acquired wealth, or held official positions for many generations, own land granted to them by the State, on which live numerous tenants, serfs, or, in some parts of the country, slaves, but these are looked upon as members of the family they serve, and the serfs, at any rate, are not bound to the land, but may move where they please. Butchers, those who cut up corpses, beggars, and criminals, are the only persons who do not enjoy the same privileges as the rest of the community. In some localities, also, dyers and workers in metal are looked down on, probably in consequence of continued intercourse with India.

Politically, Tibet may be divided into three parts:—the country under the direct rule of Lhasa, comprising all the central and western and most of the northern parts of the country, as well as a few outlying

districts in Eastern Tibet; North-eastern Tibet, most of Eastern, and a long strip called Jyade, extending westwards nearly to Tengri-nor, which is under Chinese rule; and the countries under British rule or influence, such as Sikkim, Bhutan, Ladak, etc.

The Tale Lama, ruler of the kingdom of Lhasa, or Deba-djong, as the natives usually call it, is supposed to be an incarnation of the god Shenräzig, the tutelary deity of the country. Up to 1720 he was only the spiritual ruler, but at that date the temporal power was placed in his hands by the Chinese. Under him is a regent, commonly called the King of Tibet or Desri, who is a lama chosen from one of the four great monasteries in rotation, and whose appointment, like that of all the other high dignitaries of the State, is subject to the approval of China. The Desri, with a council of five ministers—one lama and four laymen—administers the country, and acts in a judicial capacity. For administrative purposes the country is divided into fifty-three *djong* or districts, over which *djong-pön*, who act both as civil and military chiefs, are appointed by the council of ministers. There are also a number of *debu*, some of whom are chiefs of the Drupa, the pastoral tribes of the more elevated parts of the country.

Tracts of land are given to officers of high rank, and others as endowments to lamaseries. On many, perhaps all, of these, the beneficiaries not only collect the revenues, but exercise judicial rights over the inhabitants, who are their serfs and subject to all such *corvées* as they may see fit to order. Over the greater part of Tibet slavery does not exist, except, perhaps, in a very mild form, and certainly not among the pastoral tribes. In the outlying districts, however, where there is a large non-Tibetan population, as in the Tsarong province in South-eastern Tibet, regular slavery prevails, persons losing their freedom through birth, debt, or crime.

The part of Tibet under Chinese rule consists of eighteen districts of Eastern Tibet, the organisation of which is described in the *Land of the Lamas*, the Jyade or "Chinese Province," and the Koko-nor districts. In the Jyade there are 36 chiefs or *debas*, chosen from the most influential men of the country, who receive their appointment from the Chinese minister resident in Lhasa, and a yearly stipend from the Emperor of China. Under them are numerous hereditary chiefs of clans. The organisation of the Koko-nor districts is similar, but the chiefs are appointed by the imperial Resident at Si-ning. Thus, with a minimum expenditure of forces and money, China attaches to itself the frontier tribes through small allowances to the most powerful chiefs, by granting the people certain advantages in trade, and by allowing them to manage their own internal affairs.

The political organisation of the Tibetan countries within the British sphere have been described by Sir Ashley Eden and others. In Bhutan, as in Lhasa, there is a spiritual and a temporal ruler, the Dharma Raja and the Deb Raja, and also a council of ten members with subordinate district officers, and in Sikkim and Ladak the system is nearly the same.

In all parts of Tibet, both in towns and villages, the women not only manage the household work, but attend to the bartering, make butter,

milk the cows, and perform the duties of the *ula* or *corvée*. The men, aided by the women, work in the fields, act as carriers with their own yaks or mules, or hire themselves out as drivers to merchants and lamaseries. Others follow a trade or craft, working in metals, twisting yarn, or making felt. In the towns nearly all the shops are kept by women. Much the greater part of the work devolves on the women, but the position of the sex is not injuriously affected thereby. The wife is absolute mistress in the house, and joins with the men in all discussions with perfect freedom and assurance. Father Desgodins, indeed, speaking more especially of Eastern Tibet, affirms that, though the Tibetan woman enjoys great freedom in the management of the household, in trading, and travelling, she is nevertheless the drudge of one or more husbands, and is looked upon as a creature inferior to man. Other authorities do not confirm this statement, and Chinese authors attribute the superior position of Tibetan women over those of most other Asiatic countries to their superior physique, but, according to Mr. Rockhill, it is due in part to Buddhism and still more to polyandry, which gives them an important *rôle* in family life.

Property is inherited solely by the sons or brothers of the deceased to the exclusion of the wife and daughters. The former frequently shaves her head and becomes a nun on the death of her husband. Chinese authors state that half the personal property is distributed in charity and the other half sent to the lamas. The real estate, generally consisting of a large house and a few not very fertile fields, is undoubtedly retained by the family. All the children live in the house of their parent, and the sons take one wife to themselves. Among the pastoral tribes the flocks and herds, after deduction of heavy dues to the clergy, are divided among the sons, and the widow is dependent on her children or becomes a nun.

The national dress of both sexes is a very full gown, with long sleeves and high collar, called a *chuba*. It is tied tightly round the waist with a woollen girdle, and reaches down to the knees when worn by men, and to the ankles when worn by women. The gown worn in winter is of sheepskin, and in summer of native cloth. The facings are sometimes of black velvet, red or blue cloth, otter or leopard skin. In a great part of the country this is the only garment worn. Buttons serve rather as ornaments than for use. A pair of boots completes the costume among the wild Tibetans. The national boot found in districts remote from Chinese influence has a sole of raw yak skin turned up over the sides, which are formed of several thicknesses of white cotton cloth. The legs of most boots are of native cloth called *truk*. Other wearing apparel of Chinese origin, as trousers, shirts, velvet boots, etc., are worn in certain parts of the country. Among the Koko-nor Tibetans pointed caps of felt with ear-flaps and, among the wealthy, round caps covered with silk and with turned-up brims faced with fox or sable fur, are commonly used. These, it appears from Chinese works, were worn as early as the eighth century. In those districts where the men never trim their hair, the head-covering, when used at all, is only a piece of cloth or sheepskin coming down over the ears but leaving the crown of

the head bare. Caps and hats of Chinese or Mongolian origin and of various forms have been adopted in different parts of the country.

The women's national mode of arranging the hair is to make innumerable plaits falling down over the shoulders and reaching to the waist, and on these most of the ornaments are displayed—silver plates, cowrie shells, cornelian, turquoise, coral and glass beads. The only Tibetan men who wear ornaments in their hair belong to the pastoral tribes. These men wear a queue, usually of false hair, in addition to their tangled locks. The queue is usually wound round the head, and the ornaments—finger-rings, rings of ivory, small charm boxes, pieces of turquoise, etc.—form a crown. An earring is usually worn in the left ear, and a rough piece of turquoise tied to the right ear, without any setting, is a favourite ornament all over Tibet, even among the wealthy. Rosaries, besides their religious use, serve also as ornaments and as means of reckoning. Mr. Rockhill also describes, with illustrations, many other articles worn on the person, such as needle-cases, châtelaines, tinder-pouches, etc., but these are almost entirely of foreign make or origin.

Weaving is an ancient industry, having been introduced, it is said, from China as early as the seventh century. The hair of yaks and goats and the wool of sheep is spun into yarn. It is the usual occupation of both men and women among the pastoral Tibetans as they follow their sheep or while sitting in their tents. The loom is horizontal and of extreme simplicity. A vertical loom is used in some parts of the country, but the mode of weaving is much the same. The yarn is made up into balls, and passed through the threads of the warp by hand. In the manufacture of felt the Tibetans are far behind the Chinese. The process consists simply in spreading the wool by handfuls over the ground, beating it, rolling it up and soaking it in water, these operations being repeated a great number of times. The cotton stuffs used in Tibet, and also silks, satins, etc., are all brought from China or India. Dyeing is carried to great perfection, the green colours being especially fine. Vegetable dyes are almost exclusively used.

The pastoral Tibetans dwell in tents made of yak hair. Some of them are not more than 10 to 12 feet long, though frequently they are as much as 50 feet long by 30 broad. The roof rests on a ridge pole supported by vertical posts, and is stretched by cords passed over short posts at some distance from the tent, and then pegged to the ground. The stoves, which occupy the centre of the tent, are ingeniously contrived. They are made of mud and stones, with a fireplace at one end and a flue running through their entire length, so that several pots can be kept boiling at once. Leather bags for holding food, saddles, a wooden mortar for pounding tea, a tea-churn made of a hollowed log or of bamboo, a few dirty milk-pails, a log or two of wood which serve as tables, and a small quern are the principal articles of furniture.

The food of the tent-dwellers consists chiefly of tea and parched barley, or *tsamba*; the barley is obtained from the agricultural Tibetans in exchange for butter, hides, or wool. The other articles of diet are mutton, sour milk, cheese, the root of the *Potentilla anserina*, and, occa-

sionally, vermicelli and wheaten cakes. Tea is, however, the staple article among all Tibetans, being not only a beverage but a food, for it is mixed with butter and *tsamba*, and the leaves are frequently eaten. The teapots are of earthenware or metal. The best are made in Derge, in Eastern Tibet, and in many of them brass, copper, and silver are so combined as to produce a highly ornamental effect. The only alcoholic drink is barley wine.

Tibetan houses are much alike throughout the country. Those of the rich have three storeys ranged round three or four sides of a courtyard, while those of the poorer classes have only two storeys, with a courtyard in front or behind. The ground floor is used as a stable and warehouse. The walls are of flat stones held together with mud mortar, or of beaten earth. The small oblong windows are not glazed or even closed with paper, as in China, but are provided with wooden shutters, which are shut at night. In the mountains and well-wooded regions of Western Kan-su log houses are much used, built generally by Chinese carpenters. Furniture there is none, except perhaps a log of wood roughly squared, or a low Chinese table near the hearth, the smoke of which escapes through a hole in the ceiling or by the door and windows.

The Tibetan sword is of two kinds, the one having a blade running into a sharp point, while the other ends in an oblique point like Chinese swords. The guns are matchlocks, with barrels of Chinese or Indian manufacture. Forks are attached, which rest on the ground when the marksman shoots. The spear is a common weapon, especially among the black-tent people; it has a point of iron, and the shaft is strengthened with a band of iron, for the country supplies no good wood for its manufacture. The Tibetans are very expert in the use of the sling, and the tent-dwellers and inhabitants of the more remote localities have always one hanging at the waist. The bows are of Chinese origin.

Wheeled vehicles are practically unknown. Travellers ride, and goods are carried on the backs of mules, yaks, horses, donkeys, or sheep. The riding-saddle is similar to that used in China. The only purely Tibetan boat is a coracle, composed of yak hides stretched over a few bent twigs.

Marriage by capture still survives in parts of Western Tibet, in Spiti, Sikkim, and Bhutan, but elsewhere the preliminaries are very similar to those in China. Where polyandry prevails, the husbands of a woman are always brothers. Poverty and a desire to keep down population and keep the family property undivided are no doubt the origin of the practice. Polygamy is not uncommon among the wealthier Tibetans, and monogamy is, naturally, frequently met with, especially among the Drupa, where it is probably the rule. The bodies of deceased persons are cut up and given to the dogs and vultures, a custom found among other Buddhist peoples. The bodies of the poor are thrown into streams, and those of lamas are burned and cairns are erected over their remains.

In his *Notes on the Ethnology of Tibet* Mr. Rockhill gives detailed information on many other arts and implements of the Tibetans, on their religion and other institutions, which are, however, of foreign origin.

LIST OF OBJECTS

SHOWN AT THE

FRANKLIN COMMEMORATION MEETING, EDINBURGH,

ON 4TH JUNE 1895, AND ON SUBSEQUENT DAYS.

THE objects, which included relics of the Franklin Expedition, and of the Search Expeditions, and others connected with life in the Arctic regions, whaling and sealing, were kindly lent to the Council by the Ladies and Gentlemen, and Institutions, whose names are given below :—

BY THE UNITED SERVICE INSTITUTION, London.

Lieutenant Irving's Medal.

BY Mr. R. C. BELL, W.S.

'Memoirs of Lieutenant Irving,' by Benjamin Bell, F.R.C.S.E. (*Presented to the Society.*)

BY Miss SCOTT MONCRIEFF, Joppa.

Silhouette portrait of Lieutenant Irving. Sketch of cairn erected to his memory at Point Victory. Print representing his funeral. Photograph of his tomb in the Dean Cemetery.

BY Mr. JOHN J. W. CAMPBELL.

Stuffed penguin and skull of seal from the Antarctic seas.

BY Mr. W. G. BURN-MURDOCH.

Selection of his Antarctic sketches (twenty-five in number).

BY Mrs. SOUTTER, Kirkcaldy.

Ten Arctic sketches by Dr. A. D. Soutter ; model of an Eskimo kyak ; button with crest of Lieutenant Des Vœux, R.N., of H.M.S. *Erebus*. Relics of Captain Hall's expedition in the *Polaris*, 1871 :—Captain Hall's rifle ; two pairs of snow spectacles ; a Testament.

BY Mr. ROBERT MILLIKEN, Kirkcaldy.

Eskimo bow and arrows. Cake of cocoa left in a cairn by one of the Search Ships, probably in 1850. Log of H.M.S. *Edinburgh*, 1833-35, kept by midshipman John Irving.

BY Mr. HENRY, Gunmaker.

Large harpoon gun on stand, with harpoon ; shoulder gun, with lance.

BY Mr. B. J. MALONEY.

Proclamation offering £20,000 for the discovery and relief of the Franklin Expedition. Play-bill and epilogue printed on board H.M.S. *Assistance*, Captain Ommaney, R.N., of Captain Austin's Search Expedition, 1851. Form of record to be left in cairns.

BY COLONEL MURRAY of Polmaise Castle.

Two Arctic Discovery medals.

By the Albert Institute of Literature, Science, and Art, Dundee. Mr. John Maclauchlan, Secretary.

Sledge used by Captain Kennedy of the *Prince Albert*, sent out by Lady Franklin in 1851 ; tin case and papers left by him at Prince Regent Inlet in 1852, and found in 1875 by Captain Kilgour of the *Polynia*. Tin of meat left by Sir James Ross's Search Expedition, 1848-49, and found by Captain Soutter of the *Intrepid*, 1874. Knife found on Beechey Island, probably belonging to the Franklin Expedition. Relics of an Eskimo party which perished in Elwyn Bay. Two Eskimo knives (ivory) ; pair of snow spectacles ; Eskimo harpoon. Harpoon taken from a whale in 1894, which had been imbedded in it for at least thirty-seven years. Two stuffed Antarctic seals.

By Mr. David Bruce, Dundee.

Harpoon gun with stand ; harpoon and tackle ; two hand-harpoons ; three bomb lances ; a whale lance.

By Mr. Robert Kinnes, Dundee.

Two tins of meat left at Port Leopold to relieve Sir John Franklin's Expedition, and brought home by Captain Soutter of the *Intrepid*, 1874. Four sealskins.

By Mr. John Allen Brown, London.

(1) Relics of Captain Weddell, R.N., and of his Antarctic voyages, 1820-24 :—

Captain Weddell's portrait and seal ; log of the *Beaufoy* ; three MS. charts ; autograph letter and two sketches by Captain Weddell ; and other documents relating to him. (*Presented to the Society.*)

(2) Relics of Sir James Ross's Antarctic Expedition, 1839-43, with H.M.SS. *Erebus* and *Terror* :—

Placard offering double pay to petty officers and seamen. Sheet of copper torn from the *Erebus* in a storm. Portrait of Dr. M'Cormick of the *Erebus*. Play-bill on satin, 1841. Coal from Kerguelen Island.

(3) Relics of Sir Edward Belcher's Franklin Search Expedition, 1852-54 :—

Play-bill of the *Resolute*, Captain Kellett, C.B. Vane and line left by the Franklin Expedition on Cape Riley, and three stones from the cairn.

By Mr. Robert Henry Johns.

Arctic Discovery medal granted in virtue of the services of his father, who perished with Sir John Franklin.

By Admiral A. H. Markham.

Eight chromo-lithograph copies of pictures by Lieut. Cresswell, R.N., illustrating the cruise of the *Investigator*, under Captain Sir Robert M'Clure, when searching for Sir John Franklin. Engraving of the "Arctic Council" held in 1847 to consider the route along which search for Franklin should be directed.

By Professor Copeland.

Model of Eskimo kyak. Model of the *Germania*. Two ice spurs for climbing smooth ice ; and two charts of Greenland coast.

By Dr. Buchan.

Ten volumes relating to the Arctic regions.

By Admiral Sir Leopold M'Clintock.

A 4-man sledge used by him during his successful voyage in the *Fox*, 1857-59,

to determine the fate of Sir John Franklin's Expedition. Model of a 10-man sledge used on the same occasion. Medallions of Sir John Franklin and Sir James Ross.

By Mr. James Spence.

Two letters written by Sir John Franklin.

By Sir William Turner (from Museum of Comparative Anatomy, Edinburgh University).

Skulls of walrus, musk ox, polar bear, and white whale ; and three heads of deer.

By Mr. David MacRitchie.

Models of Eskimo umiak and kyak, and a narwhal tusk.

By Mrs. Rae.

Portraits of Sir John Franklin, Dr. Rae, and Sir George Simpson, Governor of the Hudson Bay Territory.

By Mr. G. H. Johnston.

Captain Scoresby's drawing instruments. Chart of the Arctic seas, 1854. (*The chart has been presented to the Society.*)

By Mr. D. Alexander, Dundee.

Three narwhal tusks.

Mr. Fred. C. Stephen, Dundee.

Stuffed Polar bear, polar bear's head, walrus head, and seal. Model of an Eskimo canoe and fishing implements. Eskimo bow and arrows in case ; and six sealskins.

By Messrs. D. Livie and Sons, Dundee.

Photograph of a whale boat.

By the Arbuthnot Museum, Peterhead. Mr. R. Robertson, Hon. Secretary.

A large and valuable collection of objects connected with Eskimo whaling and fishing, and with Eskimo dress, industry, and ornament. Models of canoes, Eskimo kyak, snow shoes, lances and spears, bows and arrows, and dog reins. Model of a whale boat ; harpoons ; stocking worn by Captain (Sir James) Ross in the Polar regions ; seal club ; portion of Franklin stores from Davis Strait ; and many other articles.

By Dr. D. Walker, late Surgeon-naturalist of the *Fox*.

Portraits of himself and Lieutenant Schwatka. (*Presented to the Society.*)

By Mr. Alex. Carmichael.

Two water-colour sketches taken in the Arctic Seas by Lieutenant John N. Anderson, R.N.

By Rev. James Drummond, Bannockburn.

Franklin's narrative of his second expedition to the Polar Sea, 1825-27.

Memoir by Dr. (Sir John) Richardson on fishes and plants found in Arctic waters, with figure of "Tripe de roche."

By Messrs. Nicol & Jack, Dundee.

Harpoon gun, with harpoon ; common whale lance ; gun with explosive lance ; and a burst explosive lance.

By the Free Public Museum, Liverpool. Dr. H. O. Forbes, Director.

Objects collected by Dr. David Walker, naturalist on the *Fox* :—

(1) Franklin Relics.

A prayer-book, three knives, seven buttons, two pairs of scissors, a piece of canvas, thong from an officer's boot, fragment of sulphur from a seaman's jacket pocket—all from a boat belonging to the Franklin Expedition, found on the shores of King William's Land.

Piece of lint and an English farthing of 1839, from the medicine chest found at Point Victory.

Knife, with bone handle, made by Eskimo from a cutlass belonging to the Franklin Expedition.

Bow, bound with sinew, and two iron-headed arrows, made by Eskimo from the wood of one of the Franklin ships.

Spoon, the bowl made from a musk-ox horn and the handle from the wood of one of the Franklin ships.

An exact tracing of the record of the Franklin Expedition found in a cairn at Point Victory ; framed in wood made from the Franklin boat found on the shore of King William's Land, with a piece of copper from the same.

(2) Other Objects.

Seaweed on paper, collected by Captain Crozier, R.N., Franklin's second-in-command, at the Falkland Islands, during Ross's Antarctic voyage, and so labelled in Captain Crozier's handwriting.

Model of an Eskimo in his kyak, made by a Greenland Eskimo.

Eskimo comb and small implement of walrus ivory.

Small stone box containing brown sugar, deposited by Sir Edward Parry at Fury Beach in 1824, and used by the M'Clintock Expedition in 1859.

By Mr. W. G. T. Watt, Stromness.

Copy of a statement made to Lady Franklin by a sailor of the *True Love* whaler, with sketch of the position of Franklin's ships as indicated by an Eskimo.

Letter of June 1845, from Mr. Ross, Solicitor, Stromness, regarding the attestation of Sir John Franklin's papers.

By Mr. Thomas Bonnar.

Five water-colour drawings of scenes in the Arctic regions, by J. C. Wintour, made from sketches taken by Dr. R. A. Goodsir in 1851-52.

Captain Kellett's report to the Admiralty of his expedition with the *Herald* and *Plover* in search of Sir John Franklin in 1849 ; reprinted from *The Times* of 24th and 25th January 1851.

Part of a letter, dated 20th May 1851, from Dr. Robert Goodsir, with sketch of coastline as seen from the *Lady Franklin*.

Portions of Dr. Goodsir's MS. account of the *Advice* Expedition.

Twelve pencil sketches by Dr. Goodsir. Print showing view of the "Devil's Thumb," from Dr. Goodsir's sketch. Engraved portrait of Sir John Franklin. Portraits of the principal officers of the *Erebus* and *Terror*. Map showing the course of the *Fox*. Draft of an address by Dr. Goodsir to the crew of the *Advice*. Two messages left in cairns by Captain Penny of the *Advice*, and other documents.

MS. by Dr. R. Goodsir, entitled "Franklin's Fate, by an Old Arctic Man."

By the Royal Geographical Society.

North Polar Chart.

By Messrs. Russ and Winkler.

Skin of Polar bear.

By Mr. W. B. Wilson, W.S.

Drawing of Lieutenant Irving's tombstone.

By Miss Gilroy, Dundee.

Pieces of chocolate and tobacco left in a cairn by Sir J. Franklin's expedition.

By the University Court, University of Edinburgh—The Rae Collection.

1. Franklin relics found by Dr. Rae in 1854, being some of those for which he and his men received the Government reward of £10,000, as having been the first to ascertain the fate of the expedition. They consist of a silver spoon and silver fork which belonged to Sir John Franklin, a silver fork which belonged to Captain Fitzjames, three parts of watches, three coins, a gilt button, and an anchor ornament.

2. Personal relics of Dr. Rae :—gold watch, worn on his expeditions ; Arctic Discovery medal, with clasps for 1846-47, 1848, 1849, 1850-51, and 1853-54 ; gold medal awarded by the Royal Geographical Society ; needle-case ; books ; copy of Shakespeare and a book of sacred poems, which accompanied him on his journeys ; moccasins.

3. Dr. Rae's collections, consisting of Eskimo spoons, knives, canoes, bows and arrows, war club, stone lamp, North American Indian dresses, carved stone plates and stone implements, pipes, charms, hunter's rattle, medicine men's rattles, etc.

By Mrs. Hargrave.

North American Indian dresses, knives, bows and arrows, tomahawk, pipe-bowls, snake-charms, powder-horn, models of canoes, and photograph of Dr. Rae.

By Mr. John Maclauchlan, Dundee.

Medal belonging to Dr. Alexander M'Donald, R.N., Surgeon of the *Terror*, recovered by Sir Leopold M'Clintock from the Eskimo of Boothia in 1859, and sent to Mrs. Mollison, Dr. M'Donald's sister, with a letter from Lady Franklin, which accompanied it.

Book of autographs with Sir John Franklin's signature.

By Mr. Andrew Wylie, Stromness.

Letter to A. I. Wylie, thrown overboard from the *Prince Albert* in 1851, by Captain Kennedy. Letters to A. I. Wylie, written, three by Lady Franklin, three by Miss Cracroft, and one by Captain Kennedy.

By Professor Chiene.

Documents left by the late Dr. Robert Goodsir, among which are the following :—

I.—*Letters relative to Dr. Harry Goodsir of the Franklin Expedition.*

1. Letter from Earl of Haddington, dated 13th June 1844, to Lord William Douglas, stating that there would be no Arctic Expedition. Lord William had written on behalf of Harry Goodsir, who had offered his services.

2. 3. Letters, dated 24th January and 24th February 1845, to Harry Goodsir from Edward Forbes, the eminent naturalist. In one letter Forbes says : "Dear Harry,—I have had Sir John Franklin spoken to. I am advised to be easy. If you go, it must be as assistant-surgeon—so be prepared." Dr. Harry Goodsir was, in March 1845, appointed acting assistant-surgeon of H.M.S. *Erebus*, and thus sailed with Sir John Franklin. He left Edinburgh for London in March 1845, to join his ship.

II.—*Dr. Harry Goodsir's Letters* (thirty in number) *from* H.M.S. "*Erebus.*"

He writes to his father (John Goodsir, Largo Manse, Fife) from Greenhithe, on the evening of 19th May 1845: "We are just starting, and I take this last opportunity of writing you from England." The course of the *Erebus* is described in other letters, as follows: on 23rd May she was off Aldborough; on the 31st May she was at Stromness; on 3rd June she was "about 60 miles to the north-west of Stromness, off the Stack Rock"; on 28th June in Davis Strait, lat. 63°; on the 30th June in Davis Strait, "crossing the Arctic Circle"; on 2nd July off the island of Disco, Baffin's Bay; and on 12th July 1845, off Whale Fish Islands. Here the letters end.

III.—*Letters from John Goodsir*, of The Manse, Largo, to his son Harry, in June 1844, and a letter relative to Harry from his brother John, afterwards the celebrated Professor of Anatomy in Edinburgh University, dated 19th August 1845.

IV.—*Letters of Dr. Robert Goodsir*, of two Franklin Search Expeditions.

Robert, a brother of Harry Goodsir, was Surgeon on board the Franklin Search Ships *Advice* and *Lady Franklin* (Captain Penny). The letters are from the *Advice* off Cape Walter Bathurst, lat. 74°, 2nd August 1849; and Home Bay, "west side of Baffin's Bay," 68° 30′, 21st and 22nd August 1849. Others are from the *Lady Franklin*, off Stromness, on 12th March 1850; off the island of Disco, Baffin's Bay, lat. 69°, 2nd May 1850; and Frow Island, lat. 73° 20′ N., 30th June 1850.

V.—*Dr. Robert Goodsir's MS. Account of the Search Expedition in the "Advice."*

The *Advice* sailed from Stromness on 17th March 1849. Goodsir writes (no date given): "At last, after months of hopes, fears, and disappointments, we are fairly under weigh for Lancaster Sound. God grant that we may see or hear something of them!" (Sir John Franklin's ships).

VI.—*Printed Matter*, including—

1. A playbill of the "Royal Arctic Theatre," 28th February 1851, on board H.M.S. *Assistance* (Franklin Search Ship), in which Mr. Clements R. Markham (then aged 21, and now P.R.G.S.) played in *Charles XII.* This bill was printed on board ship.

2. James Wyld's Chart of the Arctic Regions, dedicated to Lady Franklin (no date).

3. *The Daily Scotsman* of 24th September 1859, containing the official report, dated 21st September 1859, of Captain F. L. M'Clintock, R.N., who commanded the yacht *Fox*, despatched to the Arctic regions at the expense of Lady Franklin. Captain M'Clintock brought home two cases containing relics of Franklin's Expedition, and the record, found at Point Victory, dated 25th April 1848, and signed by Captains Crozier and Fitzjames, wherein the death of Franklin on 11th June 1847 is recorded, and it is stated that the *Erebus* and *Terror* were abandoned on 22nd April 1848, and that the survivors (105 souls) were on their way to the Great Fish River. *All perished.*

(*All the above documents have been presented by Professor Chiene to the Society.*)

VII.—*Portrait of Dr. Harry Goodsir taken the day before he sailed in the "Erebus."*

By Captain Shaw Kennedy.

A walrus tusk, walrus bone, stuffed reindeer head, and three nodules of ironstone.

By Professor James Geikie.

Specimens of basalt from Dundee Island, Antarctic Ocean.

Many of the smaller and more valuable articles were exhibited in cases kindly lent for the occasion by Messrs. Dowell, 18 George Street, Messrs. Jas. H. Smith & Co., 79 George Street, and Messrs. Cicori & Co., 59 Frederick Street.

Fred. Bailey, Lieut.-Colonel,
Secretary.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Appointment of an Hon. Librarian.

At a meeting of Council held on May 24th, the Hon. J. Abercromby was appointed Honorary Librarian in the room of the late Mr. John Gunn.

Presentation of Polar Relics to the Society.

As a result of the exhibition held in connection with the Franklin Commemoration on June 4th, several interesting and valuable collections have been presented to the Society, which is thus recognised as the fitting custodian of geographical relics of public interest. Among the objects thus acquired may be mentioned various relics of Captain Weddell, R.N., of Antarctic fame, presented by Mr. John Allen Brown, and a collection of documents presented by Professor Chiene, relating to Dr. Harry Goodsir, Assistant-Surgeon of the *Erebus*, who was lost with Sir John Franklin. These, with other gifts, such as portraits of himself and of Lieut. Schwatka, presented by Dr. D. Walker of the *Fox*; a memoir of Lieut. Irving of the *Terror*, presented by Mr. R. C. Bell; and a map of the Arctic regions, published in 1854, and presented by Mr. G. H. Johnston, form the nucleus of a geographical museum, which, it is hoped, will rapidly increase in size and importance.

Members in Arrear.

At a meeting of Council held on July 19th, the names of twenty-five members, whose subscriptions are more than two years in arrear, were removed from the roll of the Society under Law IX.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

Geography at the Universities.—*The Geographical Journal* for July contains reports of the Reader in Geography at Oxford, the Lecturer in Geography at Cambridge, and the Owens College Lecturer. Mr. Mackinder delivered in the Michaelmas and Hilary terms courses of lectures especially intended for undergraduates reading for honours in history, and in the summer term a course to

members of the Day Training College. The numbers who attended in the first two terms were larger than in the previous year. Mr. R. T. Gunther, B.A., was elected to the geographical studentship; he will prosecute researches in physical geography in the Phlegræan fields of Naples. Since the beginning of the Michaelmas term, 1890, 337 members of the University have passed through Mr. Mackinder's classes, and since the beginning of the Michaelmas term, 1892, there have been, in addition, 77 registered lady students. Besides his classes at Oxford, Mr. Mackinder has given lectures on geographical method, and a course on the "History of Geography" at Gresham College, London.

Mr. Yule Oldham also took historical geography as his subject during the past year. The attendance was about the same as in the previous year. While special lectures draw large audiences, continuous courses will, in Mr. Oldham's opinion, never be attractive as long as geography finds no place in the examinations. The studentship has never yet been awarded, no suitable candidate having presented himself, but it is encouraging to hear that several well-qualified candidates have made inquiries about the studentship for next year.

At Owens College Mr. A. J. Herbertson lectured on "Cartography" during the Michaelmas term, and on the "General Geography of Europe" during the Easter term. An attempt was made to do some practical field-work in connection with the lectures on cartography, but the students, who were all in the Training College, had no time to attend. An evening course on the "Principles of Commercial Geography" was announced for the Michaelmas term, but the students who sent in their names were too few. The Manchester Geographical Society has offered its room for the evening classes next winter, and the College authorities have agreed that they shall be held there, in a more central position. The geographical appliances at Owens College are very scanty, but a grant of £20 has been spent in buying a few absolutely necessary books and maps.

The Lakes of the Vosges.—M. J. Thoulet commenced the exploration of the lakes of Gérardmer, Longemer, and Retournemer in 1889. The first is situated at an elevation of 2165 feet, and is surrounded by hills rising to heights of 800 to 1000 feet above its surface. It is fed by several torrents, which in summer are tapped to irrigate the meadows, but in spring and autumn carry down a large quantity of gravel into the lake. M. Grad has attributed the origin of the lakes of the Vosges in some cases to the action of glaciers, in others to the formation of basins before the development of glaciers. Retournemer belongs to the latter category, while Gérardmer and Longemer have been dammed up by glacial moraines, the former in the opposite direction to that by which its surplus waters are drawn off by the Jamagne, a tributary of the Vologne. In this it resembles the lake of Lourdes in the Pyrenees and the lakes of Orta and Como. The shores of Gérardmer, to a depth of about three feet, are covered with gravel, the rest of its bed consisting of a thick layer of diatom ooze. The maximum depth is 119 feet. The bottom is very irregular, rising in one place in a small plateau to only 11 feet from the surface.

Longemer lies at an altitude of 2415 feet between wooded heights rising from 300 to 1100 feet above it. This lake also is shut in by a moraine, through which the Vologne has eroded a passage. Its bed is more regular than that of Gérardmer, and its maximum depth, 96 feet, occurs just at the centre of the lake. As in the case of Gérardmer, the area down to 5 mètres (about 16 feet) forms a plateau round the shore increasing considerably in breadth towards the outlet. The bottom, except near the banks, is covered with the same fine siliceous mud.

The lake of Retournemer is much smaller than either of the others, and its

elevation is 2250 feet. It is being rapidly filled up by gravel and vegetable refuse brought down by the streams and rains. In 1877 M. Zeiller found a maximum depth of 62 feet, while M. Thoulet's deepest sounding in 1889 was not more than 38 feet.

The thermal conditions are the same as those of the Weissensee, investigated by Dr. Grissinger (*see* vol. viii. p. 545). In this lake the daily variations were found to extend to a depth of 125 feet, and hence in the shallower lakes of the Vosges thermal equilibrium is never established in summer. When the surface is congealed the subjacent layer of water assumes a state of stable equilibrium, for the solid ice is a bad conductor, and the water tends to arrange itself in strata with temperatures decreasing with the depth. On January 27th, 1894, the temperature of Longemer diminished by 2·7° F. in the upper 40 inches, and by only 1° in the lower 92 feet. The water of the Vologne and other tributaries enter under the ice and flow not far below the surface, and issue with a slightly higher temperature, having, however, somewhat cooled the water of the lake.

But climate is not the only factor that determines the temperature. The ratio of the superficial area to the volume has also an influence, a lake with a larger relative surface being subject to greater variations. The form of its bed is another factor; in lakes like Gérardmer and Longemer, having a large area of shallow water and a gentle slope towards the deeper parts, the large shallow layer will quickly change its temperature and when cooled will sink *en masse* to the depths.

M. Thoulet gives several tables of areas, volumes, temperature, etc., and notes on the colour, transparency, *seiches* and chemical constituents of the waters, in his article in the *Bull. de la Soc. de Géographie*, Trim. 4, 1894.

The Sonnblick Observatory.—At a meeting of the Sonnblick-Verein, on April 6th, Dr. W. Trabert read a paper on the scientific results of the Sonnblick observations up to the present time. From these observations Prof. Hann has shown that the central column of air in a cyclonic system does not ascend by virtue of a relatively higher temperature, for it is, in fact, colder than the air surrounding it; nor does the air in the descending current of an anticyclone acquire its greater relative density by reason of lower temperature. This conclusion gives the death-blow to the convectional theory of cyclones. Dr. Trabert has also made himself some researches into the warming of the air on mountain summits by direct absorption of the sun's heat, and has shown that at lower levels the air is chiefly warmed by convection from the earth's surface. Hann has further succeeded in estimating the daily range of temperature in the free air not affected by ascending or descending currents from mountains. In a zone such as that between the summits of the Sonnblick and Mt. Blanc this range was found to be only 1° C. (1·8° F.). Prof. Hann points out further that the observations on the Sonnblick, as on other mountain stations, throw considerable doubt on current theories explaining variations of wind velocity. Messrs. Trabert and Pernter are engaged in an extensive work dealing with the geographical relations of the above results.—*Geogr. Journal*, July.

The Simplon Tunnel.—The northern opening of this tunnel will be about a mile and a half from the present terminus of the Rhone valley railway at Brieg, and the southern a third of a mile below Iselle. It will contrast in many respects with the similar engineering works at Mont Cenis, the St. Gotthard, and the Arlberg, above all in altitude and in length. Its northern opening will stand 2254 feet above sea-level, and its southern 2080 feet; while the lowest opening of any of the other three tunnels, the northern portal of the St. Gotthard, is at a height of 3638 feet. Its length will be 12½ miles, while the Mont Cenis tunnel

is barely 8, the St. Gothard about 9⅓, and the Arlberg about 6⅓. The culminating point of the tunnel, 2314 feet above sea-level, has an elevation not much more than half that of the Arlberg tunnel, the highest of all. On the other hand, the height of the superincumbent mountain is the greatest, being fully 7000 feet, the St. Gotthard coming next with 5597 feet. The steepest gradient will be 7 per 1000, being rather steeper than in the St. Gotthard, but far less than the steepest gradients in the Mont Cenis and Arlberg tunnels.

As the tunnel will lie so low in the mountains, and its length will consequently be greater, the temperature of the rock may be expected to be higher. In Mont Cenis the temperature was 85° F., in the St. Gotthard 87½°, and in the Arlberg about 65°. For the Simplon it is estimated at 104° F., an increase of one degree of temperature being allowed for every 64 feet of depth. This will necessitate exceptional provision for ventilation, and it is intended that 1766 cubic feet of air shall be pumped in per second, whereas the St. Gotthard tunnel receives only 70 cubic feet; and with the help of vaporised water it is hoped that the temperature will be reduced to 77° F.

The most important innovation in the Simplon tunnel is the construction of two tunnels side by side, each containing one set of rails, instead of the single borings of the other great tunnels. These will be connected by cross headings at intervals of 650 yards. Only one tunnel will be completed at first, the other being left until the increase of traffic requires it. Each tunnel will measure 18 feet from the ground to the crown of the arch, and nearly 15 in diameter; its cross section will contain 250 square feet. In the Mont Cenis tunnel the progress made was 10 to 13 feet daily, with a maximum of over 16; in the St. Gotthard 640 feet a month on an average; and in the Arlberg it amounted to fully 27 feet a day. Trials which have been made with the most perfected borers show that in the Simplon tunnel the work will proceed at the rate of 19 feet in gneiss, and much faster in slate.—*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxviii. No. 2.

ASIA.

The Chams of Indo-China.—The empire of Champa, or, as M. Zaborowski (*Revue Scientifique*, No. 10) prefers to spell it, Tsiampa, is known to have been in existence in the seventeenth century. M. Harmand grouped the Chams with the Malay race, and held them to be a link between the Malays and the Khmers; while M. Maurel has affirmed that they are an Aryan people who came to Indo-China by sea. The facts now ascertained show that they established their earliest dominion in Cochin-China at a very remote epoch, before the Cambodian nation came into existence. They came by sea, and settled only on the eastern coast. Their vocabulary is to a large extent Malayan. Their alphabet resembles both the Cambodian and the Javanese, but has certain peculiarities. The radicals of their language are monosyllabic, and form dissyllables by the agglutination of prefixes and suffixes. The language is therefore akin to the Dravidian group, and this explains its analogies with the Khmer tongue. The inscriptions on the monuments of Cham construction show that the Brahmanic worship of Siva was established at a very early date, side by side with a Buddhism differing from the religion of to-day, especially in the use of Sanscrit as the sacred language instead of Pali. The era in use was that of Asoka (78 A.D.). What is most surprising is that the form of Buddhism practised in Cambodia in the tenth century was that prevailing in the north of India, not that of Ceylon.

It would seem that it was the Chams who introduced Brahmanism into Indo-China, and that before the rise of the Cambodian nation. They were, in fact, the first occupants of the soil, and spread themselves over Annam as far as Tongking.

They did not accept Buddhism from the same source as the Cambodians, for their sacred language was not Pali, but Sanscrit, which was also in use among the Javanese, and as far east as Borneo.

The Chams are now found in isolated groups at Binh Tuan, at the foot of the mountains in the present Champa, and even on the coast, at Phanri, their capital. M. Lemire estimates their number at 50,000. They are the Loï or Hoï of the Annamese. In Cambodia they are more or less mixed with Malays, and form a population of 30,000 to 60,000. They also inhabit two villages to the north-west of Saigon, and a mixed community of Chams and Malays is settled on the Hatien channel. M. Reynaud describes three types among this people—the Moï, the Malay, and the sub-Caucasian types. The first, and probably the original, type is marked by a broad face, even the forehead partaking of this enlargement, and not narrowing upwards as among the Mongols. The forehead is high and round, the eyes straight, and the nose rather low and heavy. The most striking characteristic of the Chams is a very pronounced prognathism; the upper lip sometimes barely covers the projecting jaw, and the lower jaw is rather deep. These are two characteristics of the Malay type. Among other Chams the hair is fine and lighter than that of the Annamese. The face is often downy, though some beards have been noticed. These are Mongolian characteristics; but the dorsal line, seen in profile, has the same curves as in Europeans. Among the individuals classified by M. Reynaud as sub-Caucasian, the Mongolian characteristics are completely effaced. These people are of middle height or taller, and their skin is the light brown of a sun-burnt European. Their hair is long and fine, and waves over the back of the neck. The opening of the eye is large and the sclerotic white, and the nose is longer than in other Chams. The face has neither the breadth of the Moï type nor the lozenge form of the Malay. This type is closely allied to the Battak.

At present the Chams are Mohammedans, and possess a translation of the Koran and prayers in Cham. They are a free, happy, and courageous people, and are more eager for novelties than the Annamese, and, still more, than the Cambodians. The Chams have no distinct costume; in general their dress is somewhat like that of the Battaks, and they also file their teeth in the same manner as this people.

The Red River of Tong'king.—Lieut. Léon Escande was appointed to the command of the gunboat *Moulun* in July 1892, and in the spring of 1893 surveyed the rapids on the Red River and ascended them, arriving at Laokai on the Chinese frontier in June, before the annual floods took place. The rapids are not caused by a sudden change of the level of the river bed, but by rocks and banks of pebbles which confine the water within narrow limits. At all times there is a channel in which the velocity of the current is not more than five or six knots an hour. M. Escande made two voyages up the river. On one occasion he steamed up to Laokai and back again to the sea in seven days; on the other he passed Laokai and advanced 31 miles farther, and was stopped only by want of coal. He believes that at a small expense the bed might be so regulated that the Red River would be navigable at all seasons up to Yunnan, and that in the meantime a system of towing might be organised which would soon show the value of the 435 miles of this waterway in French territory.—*Comptes Rendus*, No. 4.

AFRICA.

Meteorology of Egypt.—A memoir has been published by the Government of Egypt on the climates of Cairo and Alexandria. It is based on observations recorded

between 1886 and 1890, and collected and discussed by Mr. Engel. In Cairo the mean annual temperature for the five years is 70·3° F., the absolute maximum being 118·2° on June 13th, 1886, and the absolute minimum 48·2° on Jan. 1st, 1890. The average number of days on which rain fell during the year was 24, and the quantity only 1·18 inches. At Alexandria the annual mean temperature was 68·5° F., with a maximum of 100·6° on May 10th, 1889, and a minimum of 43·9 on Jan. 22nd, 1889. The average number of rainy days was 40, with a total fall of 8·2 inches. The chief differences in the climates of the two cities are the diurnal variations and those of the seasons. Cairo is warmer in summer and colder in winter, and is subject to greater ranges of temperature. The humidity varies almost as much in Cairo as in Alexandria, but it is less in the former town during summer. Fogs occur in both towns, in Cairo during the earlier hours of the day for the most part.—*Revue Scientifique*, June 22nd.

Cameroons.—In 1894, the missionary F. Autenrieth visited the country on the upper course of the Mabombe river, which flows into the Cameroons river. He reached its banks at Baiseng, which, with Nkom on the opposite bank, lies at the junction of several trade-routes leading into the interior. The limit of navigation lies at Nyanga, twelve hours' journey higher up, to which point the Dualla have lately extended their commercial dealings. From Nyanga Herr Autenrieth followed the bank of the Mabombe, which has here eroded its bed through basalt rocks, forming continuous rapids occasionally interrupted by falls. Above, the river turns north-westward up to its source in the Nkosi mountains. Marching eastwards into the territory of the Bonking the missionary soon found himself in a broad valley between steep hills and mountains watered by the Tinge, a torrential stream flowing into the Mabombe. Agriculture flourishes here, and village quickly succeeds village, hardly two inhabited by the same tribe. These people are fragments of tribes dwelling farther inland. Though this migration westwards, which is still in progress, is ascribed by the people themselves to a desire for greater trade facilities, it is probably primarily due to Mohammedans. An active trade is, indeed, carried on by these natives among themselves and with the tribes living nearer the coast.

Continuing his march in an easterly, and afterwards in a north-easterly direction, Herr Autenrieth came to a thinly inhabited, densely wooded country with ridges rising 1000 feet above sea-level. Broad valley bottoms with rich lava soil, in which crops thrive luxuriantly, alternate with rugged tracts of lava streams. A march of a day and a half from the Tinge valley brought the traveller to the Babong tribe, which dwells in twenty-one villages in a part of the mountains intersected by numerous ravines. On arriving at an open spot he was surprised at the sight of a mountain 8000 feet high, which he ascertained to be called Nlonako. It seems to lie on the watershed between the Wuri and the right-hand tributaries of the Middle Mbam, which is probably only some eight days' march distant.

From Babong the party marched westwards and north-westwards, arriving after a few days in a fine country of palms and pasture land lying at an elevation of 1600 to 2000 feet, which skirts a broad range of mountains extending from Nlonako to the Nkosi mountains in the west. The name of this range is Manenguba. The chief tribes of the country are the Bakaya and Banibwa. The chief industry is the preparation of palm oil, and cultivation is only resorted to in order to supply what is absolutely necessary. Except tobacco, which is grown near every collection of huts, the crops are the same as in the lower country.

Difficulties with the natives prevented the party advancing farther northwards and forced them to march westwards to the Kupe mountains. In a march of a

day and a half they came to the grassland at the eastern foot of this dome-shaped summit, which on this side rises almost perpendicularly to a height of 8000 to 10,000 feet. Leaving the friendly Maneha who inhabit this tract, Herr Autenrieth soon reached Lom, and without difficulty returned to Nyanga on the Mabombe. —*Mitth. aus den Deutschen Schutzgebieten*, Bd. viii. Heft 1.

The Sangha.—In February 1894 M. Clozel arrived at Stanley Pool and thence ascended the Sangha. Having founded a post named Tendira Carnot, on the Mambere, nearly opposite the mouth of the Nana, in lat. 5° N., he advanced northwards, and in December crossed the watershed between the Congo and Lake Tsad at an altitude of about 23,000 feet. On Dec. 16th the expedition reached, near the village of Buforo, a river named Wom, which M. Clozel believes to be the main headwater of the Logone, the great affluent of the Shari. It may be, however, that this river is the upper course of another important tributary, the Bahr Sara, crossed at Garenki by the Maistre expedition. At Buforo the Wom has a breadth of about 65 yards. The expedition followed it for 19 miles, to the village of Gonikora.—*Mouvement Géogr.*, No. 14.

Mossamedes.—In the latter half of the year 1894, M. H. Guilmin made a journey in the district of Mossamedes for the purpose of investigating its natural resources. The province of Angola, the Portuguese territory in West Africa, is divided into three districts, Loanda in the north, Mossamedes in the south, and Benguella, between the former two. St. Paul de Loanda, though it has lost much of its former splendour, is still an important town of 50,000 inhabitants, of whom 12,000 to 15,000 are Europeans. Its commerce is considerable, the principal export being coffee, which is cultivated at some distance from the coast, in a country easily reached by the river Cuanza and a railway which has now been constructed for a distance of 186 miles.

The district of Mossamedes, which has a chief town of the same name, embraces about a third of the total area of the province of Angola ; it extends from the Atlantic to the Zambesi, and is bounded on the south by Damaraland. The town, founded in 1849 by Portuguese and Brazilian colonists, has become one of the most important commercial centres on the coast, and now contains a population of 6000, about 2000 being Europeans. Its port is large, deep, and well sheltered from the south and south-west winds, the most dangerous in this region. Around the town stretches an immense sandy plain, which follows the coast from the frontier of Benguella to the Cunene and beyond. Towards the east it advances for a distance of 30 to 40 miles from the coast, to the foot of the Serra da Shella. No water appears on the surface of this vast plain, and rain falls here only once or twice in four or five years. Large river beds furrow the surface of the country which are dry through the greater part of the year, and in these beds and in the alluvium deposited on their banks the Portuguese colonists have established large farms, where they cultivate profitably sugarcane, cotton, sweet potatoes, beans, and other vegetables. At Port Alexandre, south of Mossamedes, large quantities of fish are caught and cured with salt found in the adjoining plain under a thin layer of sand. Valuable deposits of guano exist between the mouths of the Coroca, and nitrate of soda abounds in the same district. It is probable that this chemical manure occurs in large quantities, for the geological formation along the coast is identical with that of the nitrate districts in Peru and Chile.

M. Guilmin's object was to reach the fort of Humbe, at the confluence of the Caculovar and Cunene, visiting on the way the Portuguese colonies on the extensive plateaus lying on the summit of the Serra da Shella at an altitude of 5900 to 6500 feet. From Mossamedes to Pedra Grande the route lay through the sandy

plain, but at the latter place the character of the country changed a little. It was covered with brushwood sometimes impenetrable, and here and there, near a stream, a plantation was situated; but scarcity of water, money, and labour hinder the development of these undertakings. Water, however, exists near the foot of the cordillera beneath the surface, and by sinking Artesian wells the Mossamedes Company might considerably improve certain arid parts of its territory, for the soil is extremely fertile. At the mission station of Huilla, 5600 feet above sea-level, and at other colonies of the plateau, there are large fields of wheat, rye, and maize; the vine also thrives there. About 15 miles farther is the town of Chibia, and a little beyond this place the vegetation becomes more robust and baobabs begin to appear. More useful trees abound also, as india-rubber, sandalwood, and trees with bark suitable for tanning. On Sept. 20th M. Guilmin crossed the Caculovar, absolutely dry at that season, and entered the territory granted to the Mossamedes Company. On the farther bank are immense pasturages with excellent grass, and game is very abundant; spoors of zebras, antelopes, ostriches, and giraffes were frequently observed, and guinea-fowl, partridges, and doves hovered around the camp. Unfortunately the Boors are such keen sportsmen, killing animals only for the pleasure of the sport, that unless the Company protects the game by stringent regulations it will soon be exterminated.

On Sept. 23rd the party arrived at Humbe. The population of the *cancelho* of Humbe is estimated at about 100,000. The natives have not much intelligence, and engage in no work but the cultivation of *sorghum* and the rearing of cattle, of which they possess about 100,000 head. Humbe is the principal market of the interior, and 2000 head of cattle are annually exported by the port of Mossamedes. Numerous distinct tribes dwell in the conceded territory, among whom may be mentioned the Cuanhama, numbering nearly 100,000. They are stronger and better formed than the natives living between the Cunene and the sea, and are bolder and more warlike. Their principal occupation is cattle-stealing. The Boors, descendants of the early Dutch colonists, wander about in caravans driving their herds before them. They avoid all connection with other white men, and kill the blacks without pity. They rear a few cattle, but their chief employment is hunting. The country is a paradise for sportsmen, and the products of the chase would yield good returns; but the greatest riches of the concession are the gold deposits. At Cassinga, for instance, over a tract not less than 3000 square miles in extent, gold is found both in veins cropping out on the surface and in the alluvium of the river Ochitanda, and wonderful results have been obtained by the most primitive methods of washing.

The Cunene at Humbe was only 65 yards broad, the dry season being at the time nearly at an end, the depth was not more than 2 feet, and the current very feeble. In the rainy season it must spread out to a breadth of several miles, to judge from the marshes on its banks. The river is full of fish. One species which is very common attains a length of more than three feet; M. Guilmin says that it takes refuge in the dry season in subterranean waters. Perhaps, however, it is a *Lepidosiren*.—*Bull. de la Soc. de Géographie Comm. de Paris*, Fasc. iv., 1895.

AMERICA.

Geographical Distribution of Plants and Animals in relation to Temperature.—Mr. Hart Merriam has published a memoir on this subject. Botanists have formulated the doctrine that each vegetable species requires a particular quantity of heat to arrive at florescence and to mature its seeds. This sum is obtained by adding the means of every 24 hours. The isotherm of 5500° C. (9900° F.) coincides in general

with the limit between the southern and northern biological regions. But this coincidence is not everywhere apparent, as, for instance, on the western coast of the United States, where the two types are found together. It occurred to Mr. Merriam that the southern limit of northern forms might be determined by the maximum heat (the mean of the summer maxima), and, having traced the isotherm of the maxima of the six hottest weeks, he found it to agree closely with the limit. He shows that the western coast has a remarkably low summer temperature, and that consequently northern species can descend as low as lat. 35°, while the sum-total for the year is very high in relation to the latitude, and that, therefore, southern forms extend far towards the north.

The distribution is, therefore, according to Mr. Merriam, subject in the northern hemisphere to two laws ; (1) the northern limit of distribution is fixed by the total quantity of heat ; (2) the southern limit is determined by the maximum temperature. The southern limits of the Arctic, Hudsonian, and Canadian sub-zones are probably 10°, 14°, and 18° C. (50°, 57°, and 64½° F.) respectively, these figures being the mean maxima of the six hottest weeks. The sum-totals for the transitional upper and lower southern zones are 9900°, 11,500°, and 18,000° F. respectively, while the southern boundaries of the two former are marked by the summer isotherms of 72° F. and 79° F. The plants of the tropical zone require at least 25,920 degrees of heat.—*Revue Scientifique*, April.

A Primitive Tribe in Peru.—In the *Bol. de la Soc. Geogr. de Lima*, Sr. M. Basadre has a few words to say on a very primitive tribe dwelling on Lake Titicaca. The historian Herrera, in his work published in 1601, says that a reed called *totora*, which grows in large quantities on the lake, furnishes the Urus Indians with food and materials for their huts and boats. They live on rafts moored to a rock, and a whole village moves from one place to another whenever they want a change. Being asked who they were, they replied that they were not men but Urus (worms in Quichua). Such as the Urus were in 1601 are their descendants of to-day. They still live on rafts of *totora*, in huts of withes covered with mats of *totora* and clay, and never erect dwellings on land. The lake supplies them with fish and fowl, and potatoes and other victuals they obtain from the dwellers on land in exchange for fish, of which they take large quantities to Puno. They eat also the root of the *totora*. In general they guide their vessels along the shores, but on fair days they hoist their sails of matting and shoot out into the middle of the lake. In colour the Urus are lighter than the Quichuas and Aimaras that surround them, and with whom they never intermix. More detailed information about these lake-dwellers would be interesting.

Chile.—Dr. Hans Steffen has sent a preliminary sketch of his explorations on the Rio Puelo to the Berlin Geographical Society (*Verh. der Gesell. für Erdkunde zu Berlin*, Bd. xxii. Nos. 4 and 5). Accompanied by Dr. Paul Krüger, he left Puerto Montt on January 23rd, entered the mouth of the Rio Puelo on the 25th, and on February 7th reached the point which Captain F. V. Gormaz and his companion Rogers had attained twenty-three years ago. Thus far, 34 miles from the mouth, he was able to travel by water, in spite of some difficulties presented by rapids, especially where the river issues from the large lakes of Tagnatagna and Poza. Above the Tagnatagna lake, the valley of the Puelo, 2½ miles broad, runs in a south-easterly direction, and the river meanders through the forest-covered alluvium which covers its bottom. Farther up the bed is confined between steep walls, the current becomes more rapid, and at every bend rapids occur. Soon the party came to country never before explored, and, perhaps, never trod by the foot

of man. On February 8th they ascended to the wooded plateaus on the right bank of the river, and marched for four days, through forest and fuchsia thickets and hollows clothed with ferns and young larches, to the foot of a chain called Cordon Pelado, rising in the midst of the valley. From the summit of this range, and from the Cerro Mechai, in the south-easterly continuation of the Cordon Pelado, about 6 miles from the right bank of the Puelo, Dr. Steffen perceived, in a parallel valley to the east enclosed in steep cordilleras, a chain of lakes (Laguna Totoral, Laguna Azul, and Laguna Verde), all without plains on their shores, and begirt with *totora* reeds. The stream which drains them descends rapidly between the Cordon Pelado and the Cerro Mechai to join the Puelo. From the Cerro Mechai, Dr. Steffen caught sight of a chain to the east, lying beyond the snow-capped cordilleras, which he afterwards discovered to be the interoceanic watershed. It lay about 40 miles distant as the crow flies, and was named by the explorer the Geisterburg and Cordon de los Castellos, on account of its fantastic forms.

Passing to the left bank of the Puelo, the party marched south-south-eastwards, cutting across the windings of the stream, and reached an enlargement of the valley where a glacier-fed stream from the west enters the main river. From February 21st to 25th they were engaged in the difficult passage of a ravine, 11 miles long, through which the river flows from the east, and soon after came to two large and deep lakes, afterwards named Lago Inferior and Lago Superior, connected with the Rio Puelo by a short channel encumbered with rapids. The more easterly, Lago Superior, may be considered the source of the Rio Puelo. Its longitudinal axis runs north and south, and in size it cannot be much less than the Lago de Todos los Santos in the Llanquihue cordillera. Probably this lake is identical with the Lago Nuevo of Ramon Lista. The Lago Puelo, reported by Vidal Gormaz, does not exist. From the north end of Lago Superior a valley 6 miles broad extends northwards, where the explorers found a settlement called the Colonia del Valle Nuevo, inhabited by two Chilians who have obtained their concession from the governor of the Chubut. The watershed on the east is crowned with singularly-shaped summits, some of which rise above the snow-line (5000 feet), and is interrupted by some low passes, perhaps 2000 feet high, which lead into the basin of the Upper Chubut. Thus a line of communication was discovered between the Rio Puelo and the eastern flank of the Andes, instead of that which the expedition was expected to discover between the Puelo and the Nahuel-Huapi lake.

Tierra del Fuego.—The delimitation of the boundary between Chilian and Argentinian territory has been completed. The boundary stones stand on the meridian of 68° 34′ W. long. from Cape Espiritu Santo to Beagle Channel. Through the labours of the commission exact knowledge of the interior has for the first time been obtained. Two thirds of the territory are covered by rich pasturage, and large forests of useful timber have been found. In the south there are peat moors, marshes, and numerous mountain chains, with easily accessible valleys between. The most important discovery is that of a lake, 30 to 40 miles long, lying 6 to 8 miles from the end of Admiralty Sound, to which the name of Lago Taguano has been given. It is connected with Admiralty Sound by a navigable river, and is itself 200 to 300 fathoms deep. It therefore affords access to a considerable part of the interior of the island. A company has been formed for the development of the Chilian part of Tierra del Fuego, and has obtained from the Government a grant of nearly $2\frac{1}{2}$ million acres on very favourable terms.—*Verh. der Gesell. für Erdkunde zu Berlin*, Bd. xxii. Nos. 4 and 5.

AUSTRALIA.

Western Australia.—On June 11th, Sir Wm. C. F. Robinson, governor of the colony, spoke at the Royal Colonial Institute of the rapid progress recently made by Western Australia. After referring to the state of the country twenty years ago, when he first landed at Fremantle, he proceeded to give some facts and figures illustrating its present condition. At the end of 1890, a couple of months after the proclamation of responsible government, the population of the colony was only 46,290, while it is now estimated at over 90,000—an increase of 100 per cent. in rather more than four years. The telegraph penetrates into the remotest parts, and though the Coolgardie and Murchison goldfields were only discovered a couple of years ago, they are already in telegraphic communication with the whole world. At the present time there are fully 5000 miles of wire open. The Government railways extend over 570 miles, and the private lines over 572, making a total of 1142 miles. The Murchison and Coolgardie lines will soon add about 600 miles more. 500 miles of railway have been opened since 1890. Among the important public works now in progress is the conversion of the port of Fremantle into a safe and commodious harbour. At present the mail steamers call at Albany, a magnificent harbour but labouring under the disadvantage of being situated at a distance of 300 miles from the capital and seat of government, Perth. Nearly a million sterling is being expended in building breakwaters at the north and south heads of the estuary of the Swan river, in opening up the river, and in making commodious docks and wharves. It is expected that the whole work will be completed before the end of the century.

Of course gold-mining ranks first among the industries of the colony. Last year the total value of gold exported was over three-quarters of a million sterling, and it is expected that the output of this year will be worth double that amount. Valuable machinery is being put up everywhere, and new mines are constantly being discovered. In the north there are great pearl fisheries from which shells and magnificent pearls are obtained to the value of many thousands of pounds annually. These are under the supervision of the well-known pisciculturist, Mr. Saville Kent, who is also engaged in the interesting work of acclimatising certain fish, as the salmon and trout, in the rivers of the colony. Of timber for exportation there are six principal kinds, all being varieties of *Eucalyptus*, and there are also acacias, Banksias, and sandalwood. The most important of the *Eucalypti* is the jarra, or yarra, which resists the attacks of the marine *teredo* and of the white ant; it covers 14,000 square miles in the colony, and is exported in large quantities to China and Singapore. The white gum covers some 10,000 square miles, and the York gum 2400 square miles. The karri tree, which attains the immense height of 400 feet, has not hitherto been much utilised, on account of the difficulty of felling and cutting up such huge logs; but by means of works established at Augusta, near the mouth of the Blackwood river, it will soon be better known. The south is emphatically the country for men of small means and great industry, whether directed to agriculture, dairy farming, or horticulture, and the country between Perth and Champion, when the Midland Railway owns valuable agricultural land and forests, will probably develop rapidly.—*The Colonies and India*, June 15th.

MISCELLANEOUS.

The **Prince of Monaco** set sail last month from Marseilles in the *Princess Alice* for another scientific cruise in the Atlantic.

The name of **Kaiser Wilhelms-Kanal** was given to the new canal joining the North and Baltic Seas, on the occasion of its inauguration, on June 21st.

An article on the fauna of the **White Sea**, of great interest to naturalists, is published in the *Revue Scientifique*, No. 23. It is from the pen of M. W. Schimkévitsch.

The **Algonquin National Park**, which is to be formed in Ontario for the preservation of its animals and plants, will comprise about a million acres of forest land.—*Science*, N.S. vol. i. No. 23.

M. Hourst, naval lieutenant in command of the flotilla of the Niger, has surveyed two series of lakes to the north-west of **Timbuktu**, one of which is 68 miles long.—*Comptes Rendus*, Nos. 9 and 10.

An extraordinary **International Congress of Americanists** will be held in Mexico from October 15th to 20th. Besides the subjects chosen at the meeting in Stockholm, a number of questions relating to Mexico will be discussed.

A minimum thermometer set up on the summit of **Mt. Blanc** has shown that the lowest temperature last winter was −45·4° F. At the same time the temperature at Chamonix sank to −18·4°, while in January it fell to −31°.

By a treaty between **Chile and Bolivia**, the former agrees to restore to Bolivia the territory held in pledge by her since 1884 (recently relinquished by Bolivia to Argentina), and further cedes to Bolivia a port on the Pacific, between Tarapaca and Arica, from which a railway is to be constructed to La Paz.—*The South American Journal*, June 22nd.

The following areas of the **German colonies and protectorates** are given in the *Verh. der Gesell. für Erdkunde zu Berlin*, Bd. xxii. Nos. 4 and 5 :—Togo, 23,000 square miles ; Cameroons, 191,000 ; South-West Africa, 322,400 ; German East Africa, 384,000 ; Kaiser Wilhelmsland in New Guinea, 70,000 ; the Bismarck Archipelago, 20,100 ; the north-east part of the Solomon Islands, 8600 ; the protectorate of the Marshall Islands, 150.

On the northern coast of New South Wales is a safe anchorage protected by a belt of islets, the southernmost part of Barrier Reef, known as **Coff's Harbour**. It is in the immediate neighbourhood of Bellingen river. The Government is erecting wharves, warehouses, etc., and a branch of the North Coast Railway will probably be extended to the harbour. These works will open up a large area of country in the basins of the Bellingen and Orara rivers.

Last May, in a valley near the Plitvic lakes, Croatia, between Plaski and Jesenic, a **new lake** came into existence, which is at present six miles long and has a depth in some parts of over 160 feet. It has not been ascertained where the water comes from. It dashes out of the lake with a great noise into one of the chasms so common in that country. The flooded land was occupied by some of the best arable fields in the district, and hence the event has caused great loss to the people. Near Jezerana also a new lake has been formed.

Professor T. C. Chamberlin delivered the presidential address before the Geological Society of America in December last, taking for his subject the structure and movement of the **glaciers of Greenland**, as observed by him between Cape Desolation and Inglefield Gulf and at Disco Island. The glaciers closely simulate the foliation and contortion of gneiss, and not only are the foliations twisted in gneissic fashion but they are fractured and faulted, and along the fault-line the

laminæ are affected by drag precisely analogous to that found in faulted rocks. Prof. Chamberlin's observations tell against the theory of viscosity; the ice was crevassed in passing over an undulation of even moderate dimensions, and there was no indication that boulders in sinking through the ice had carried the laminæ down, as they might be expected to do in a viscous body. The ice of Greenland, on its western side at least, seems never to have advanced much beyond its present limit in recent geological times, and hence the glaciation of the American mainland cannot have had its source in Greenland.

In the *American Meteor. Journal* for June, Messrs. H. E. Warren and G. C. Whipple describe a new instrument they have invented for the determination of temperatures at inaccessible points, as the depths of the sea, Artesian wells, etc. It is called the **thermophone**, and resembles Siemen's resistance thermometer more than any other. Advantage has been taken of the fact that different metals have different electrical chemical co-efficients. Two coils, usually of copper and German silver respectively, are placed side by side and connected with a battery and a cross wire, along which slides the end of the wire passing round the galvanometer. When the wire of the galvanometer is so placed that no current is indicated, the temperature may be calculated from the sections of the cross wire. It has often been found advisable to use a telephone in connection with a circuit breaker in place of the galvanometer; hence, no doubt, the name chosen for the instrument. It sets very quickly and need not be brought to the surface of the water, like Negretti and Zambra's thermometers, for every reading.

NEW BOOKS.

Thirty Years' Work in the Holy Land: A Record and a Summary (1865-1895). Published for the Committee of the Palestine Exploration Fund. New and Revised Edition. London: A. P. Watt and Son, 1895. Demy 8vo, pp. 256.

In 1886 Mr. (now Sir) W. Besant prepared the first popular sketch of the work done under the auspices of the Palestine Exploration Fund, in the preface to which he modestly described it as a *résumé* pointing out "in general terms the Biblical gains resulting from the work of the Society"; and showing, "also in general terms, what remains to be done." That 5000 copies of that first edition were sold is proof that the book had a charm and interest for the public which its author did not claim for it. The fuller details of the Society's work are regularly published in its *Quarterly Statement*, and other rather numerous publications, but for the general public, a small volume, so well put together as this is, indicating the principal gains to the geography and archæology of Palestine, is of the greatest interest.

It appears that hitherto our ancient geography of this oft-visited and described country has been about as mythical as the legends told at its various sacred places. It is only now that we are able to identify very many of the old sites with something like certainty. In Appendix II. are given a list of 132, in Western Palestine alone, identified by Major Conder. Take one example from among these:—No. 22, Bethabârah, where John baptized (and for which the revised version, on the authority of good MSS., reads Bethany): it was placed on the Jordan in the same parallel as Jericho,—why, or on what authority, we know not. The sceptic, with as much credulity as the monk and greater ignorance, drew from this that the writer of the fourth gospel confounded this place with Bethany near Jerusalem, and that Christ could not have been at Cana in Galilee, eighty miles distant, "the third

day" from the interview at Bethabâra (John i. 28). Now among the 9000 names collected, and among them over forty fords, there is only one 'Abârah, and it is one of the main fords of the Jordan, just above where the Jalûd river from the valley of Jezreel, after passing Beisân (the ancient Bethshan or Scythopolis), falls into the Jordan, and about twenty-two miles in a straight line from Cana. Bethania was the well-known form, used in the time of Christ, for the older form Bashan, designating the district "beyond Jordan." Beth-abârah, or the house of the 'Abârah, was apparently beyond Jordan "in Bethania," and accounts satisfactorily for both readings. It is at no great distance from Cana (John ii. 1), and agrees with the only positions now reasonably assignable to Ænon and Salim, also associated with the Baptist (John iii. 23), viz., at 'Ainûn near Sâlim in the Great Wâdi Fâr'ah, to the south of Beisân. Results for Biblical, classical, and mediæval geography like these are numerous, and interesting to all readers.

We note what must be a misprint on p. 194; in describing the very curious ancient Jewish tomb, quite recently discovered, two hundred yards west of Jeremiah's grotto and close to the site supposed by Major Conder to be that of Golgotha or Calvary,—the "loop-holes" are stated to be "four feet wide": surely one foot is the most they can measure by the plan, or possibly less.

Diary of a Journey through Mongolia and Tibet in 1891 *and* 1892. By William Woodville Rockhill. Smithsonian Institution: 1894. Pp. xx + 413.

For the reader in search of purely scientific facts regarding a newly-explored country, the diary form of travels is in many respects inconvenient. Whatever be the particular branch of science in which he is interested, whether climate, geology, biology, or anthropology, he can elicit the desired information only after complete ransacking of every page. Yet we believe Mr. Rockhill has done wisely in keeping his narrative in the form in which he first wrote it. In this form it appeals to the general reader because it is so human. The interest never flags. As we read we almost seem to feel ourselves to be of the party. The discomforts and annoyances incident to travel through Central Asia afflict us too. Impatience at delay is a very prevalent sensation—delay, it may be, due to physical difficulties, but oftener to human cowardice, greed, or inexplicable "cantankerousness." The climax is reached at the end of Part III., when Mr. Rockhill is compelled to abandon the great hope of his journey, and sorrowfully find his way back through Tibet and China to the coast. The narrative is divided into five parts. In the first, "From Pekin through Mongolia to Kumbun," Mr. Rockhill covers sufficiently familiar ground. With the exception of the first 250 miles, the route lies up the Hoang Ho, or Yellow River, until the boundary of Tibet is reached at Lusar in long. 101° E. and lat. 36½° N. In Part II. the route is continued westwards through various districts and tribes, the altitude gradually rising from 9000 feet at Lusar to 16,348 feet at the Wahonjamkar pass, long. 98°40′ E., and then falling again to 9000 feet at Naichi Gol in Tsaidam (94°40′ E.). So far the journey had occupied 5½ months—from November 30, 1891, to May 16, 1892. The rest of the outward journey is recounted in Part III., "From the Naichi Gol to Namru Dé, near the Tengri Nor." This contains the most thrilling part of the narrative. The route lay chiefly through unexplored country at an altitude of 14,000 to 16,000 feet. Freezing nights, broiling days, snow-storms, mosquitoes, bad fare, and semi-starvation were amongst the common experiences, and tried severely the tempers of the party. The headwaters of the Murus or Yang-tzŭ-Kiang were crossed about long. 91° E. lat. 33° 40′ N., at an altitude of over 16,000 feet. This was still below the snow-line, which in those regions Mr.

Rockhill estimates at over 17,000 feet. On July 8th, after reaching Namru (long. 90° 20′ E. lat. 32° N), our intrepid traveller writes: "It now looks as if we might reach Shigatsé, or at all events get so near it that the Tibetans will have to send us on to India." But it was not to be. On July 9th we read: "The fate of every one who has tried to get into Tibet has overtaken me. This morning by daylight a number of well-armed Tibetans came to camp, and said," etc. etc. Fortunately Mr. Rockhill was able to arrange matters so far as to be allowed to return by a different route, which (described in Parts IV. and V.) led in an easterly direction to Batang on the Yang-tzŭ-Kiang and thence to Shanghai. The volume is enriched by five appendices of scientific interest. Appendices I. and II. contain vocabularies; Appendix III. discusses the plants of Tibet; Appendix IV. is a table of latitudes and altitudes; and Appendix V. gives the mean monthly temperatures during the journey. A detailed map of the route makes the narrative easily intelligible; and the illustrations are of great value and interest, being to a very large extent illustrative of the customs of the people. The letter-press abounds with descriptions of the life, religion, and superstitions of the tribes and races encountered on the journey, which from first to last occupied about a year. Mr. Rockhill has already gained renown as a traveller and explorer, and the present narrative is a fitting sequel to his former great work on the *Land of the Lamas.*

Le Voyage de Mon Fils au Congo. Compiled by the Duchesse D'Uzès. Paris: E. Plon, Nourrit, et Cie., N.D. Pp. 342.

A melancholy interest attaches to this record of the ill-fated expedition up the Congo and the Ubangi in 1892-93, under the command of the young Duc d'Uzès. The work under review is little more than a compilation of the letters which the duke wrote home during the course of his journey; and being written, not for the public, but for the mother to whom they were addressed, they are quite informal in tone. Nevertheless, they form a faithful if superficial record of the expedition.

The aim of the expedition was to ascend the Congo to a point near the equator, and then, striking in a north-easterly direction, reach the Nile. This route was regarded with so much hope of success that the mother and son had arranged to meet at Cairo, she travelling from France and he descending the Nile. But this pleasant reunion never took place.

The young leader's equipment was certainly formidable, and as certainly expensive. His following consisted of fifty Algerian ex-Zouaves, duly officered, besides a squad of workmen. Indeed, were it not that the affair had a really tragic side to it, and that the Duc d'Uzès, as seen in the admirable portrait prefixed to the work, was a brave, likeable young fellow, one would be tempted to compare this with a certain memorable expedition to Port Tarascon. The duke himself, in the course of his leisurely progress up the lower Congo, does indeed recognise that, for a time at least, the whole affair was something of a picnic. How very gentle their progress was may be estimated from the fact that, six months after its departure from Marseilles, the expedition was only steaming slowly up the Ubangi, not very much above its confluence with the Congo.

At Brazzaville, where he spent seven weeks, not unhappily, at the Catholic Mission, the duke decided to change his route. The way by Stanley Falls was blocked by threatening Arabs, so it was agreed to ascend the Ubangi to Abiras, and thence proceed eastward on a line considerably north of the northern boundary of the Congo Free State. In this way, something might be done towards extending French influence, and so checkmating the Belgians and the British. Accordingly,

armed with treaty-making powers, delegated by the French administrator at Brazzaville, the duke and his company, embarking on board two steamers belonging to the colonial government, resumed their ascent of the river. Many interesting facts relative to the native populations inhabiting the banks of the river are touched upon here, as throughout the letters. Almost without exception, the villagers were friendly; no doubt largely owing to their appreciation of the superior power of the French and the Belgians, whose subjects they nominally were. Yet many of those people were cannibals, although the food which they sold to the French party was of the most innocent description, such as poultry, eggs, vegetables, and fruit. At one village, the duke records that they purchased some small fish, "rappelant beaucoup, en friture, les *whitebeasts* de Londres."

The voyage up-river was slow, and although they left Brazzaville on 24th September it was not until 3rd November that they attained to Bangi; which post marks the limit of navigation for large vessels ascending the Ubangi. Here they were detained nearly four weeks, until they had secured a flotilla of native pirogues, in which to proceed to Abiras. But at length they got started, in high feather, with the French flag flying in each of their sixteen pirogues, which were paddled and poled by native crews. Mobaye was reached on 6th January, and five days later they were at Abiras. Here it was that the expedition practically collapsed. It is true that, after their arrival, they and the small garrison of the post, with the aid of their Nsakkara allies, engaged in a successful campaign against the neighbouring Bubus, who had deserved punishment by their recent murder of M. de Poumayrac. But the health of the leader and his lieutenant here broke down, and it became imperative that they should retrace their steps. It is unnecessary to follow the brief and depressing entries in the duke's journal, for at this point his letters cease. From Brazzaville he travelled overland to Loango, where he got a vessel to take him to the Portuguese station of Landana, some distance down the coast. Thence he made his way to Cabinda, where, on 20th June, he succumbed to the illness which had been undermining his strength for the past four months.

Thus, the Uzès expedition proved a failure, having added nothing to the sum of geographical knowledge, unless it be the names of a few unrecorded villages. The duke, however, had got together a small Banziri vocabulary, which is printed in this book; and his descriptions are bright, interesting, and instructive. The numerous illustrations by Riou are a great adornment to the text.

Six Months in a Syrian Monastery. By Oswald H. Parry, M.A. London: Horace Cox, 1895. Pp. xviii + 400. With Illustrations by the Author.

Mr. Parry's book records his experiences in Mesopotamia during the summer of 1892, in the course of a journey undertaken "on behalf of the Syrian Patriarchate Education Society, in order to inspect the elementary schools already established by the Syrian Patriarch of Antioch with the help of friends in England, and to report generally on the prospects of effectually promoting education in the churches under the Patriarch's jurisdiction." Landing at Alexandretta he proceeded to Aleppo, and thence, by way of Birejik, to Diarbekr, whose truly Oriental life he pictures admirably. Thereafter, turning to the south-east, and passing "a fine old bridge across the Tigris," built by the Saracens in 743 A.D., he came to Mardin, to a description of which city and of its Moslem and Syrian inhabitants he devotes three chapters. "About five miles eastward of Mardin, and lower down towards the plain, lies the monastery of Deir-el-Za'aferan," and this is the "Syrian Monastery" which was Mr. Parry's home during the greater part of his stay in the East.

His most important expedition from Deir-el-Za'aferan was to Jebel Tur, "the

mountain-home of the Syrians." "The mountains of Jebel Tur occupy the north-east corner of Mesopotamia, stretching eastward from Mardin to Jezirah, with their southern and western spurs reaching down into the plain all along the line that runs through Dara, Nisibin, and Tchelagha. Northward the bend of the Tigris shuts the mountains in, while westward they run into the range of Karaja-dagh." As a guide to this little-known district, Mr. Parry has a very minute map, appropriately placed, which is of the greatest use in enabling the reader to follow his movements in the succeeding chapters (xiii.-xv.).

It was in the latter part of August that Mr. Parry set out from the monastery on his expedition to Jebel Tur. In mid-October he found himself making one of a party from Mardin to Mosul, at which place he, of course, visited the ruins of Nineveh. Four subsequent chapters are devoted to "The Old Syrian Church," after which comes an account of "The Yazidis or Devil-Worshippers of Mosul, and El Jilwah, their sacred book." An itinerary and a glossary are appended, but although the former states with precision the time occupied by caravans in proceeding from one stage to another, the ordinary reader is apt to lament the want of a map of the whole territory traversed by Mr. Parry, with those stages specially marked.

That the writer is also an artist is clearly shown by the illustrations with which he has adorned his book; and equally graphic is his brief description of a party of Armenians who joined his caravan (p. 15):—"Great sallow-faced men with heavy jaws and aquiline noses starting straight from their foreheads, bushy eyebrows and coarse black hair, they did not prepossess us in favour of their race." And, *à propos* of Armenians, Mr. Parry has some very sensible remarks (p. 261) on the subject of Eastern "atrocities." Five of the illustrations are reproduced from photographs taken by the author; but one looks in vain for the "good photograph" (p. 153) of a troup of Arab-Kurds, who "formed a most picturesque company as they passed the lake, with their long spears and scarlet banners, riding on fine Arab mares." Such a picture would have helped to equalise a book which deals so largely in interviews with bishops and patriarchs, and with the machinery of churches, schools, and monasteries.

De Paris à Bombay, par la Perse. Par Auguste Lacoin de Vilmorin. Paris: Firmin-Didot et Cie., 1895. Pp. 368.

This is one of the many books of travel regarding which the reader is inclined at almost every page to ask, "Why was it ever written?" The author, a youth of twenty, on completing his studies at a Parisian Lycée started on a trip to Constantinople. By a series of accidental circumstances he was led onward to Tiflis, Tabriz, and Teheran; whence he returned home *viâ* Ispahan, Bushire, and Bombay. Without any knowledge of the language or history of the country which forms the subject of his book, it is no wonder that the daily record of his journey along a well-beaten and familiar track should ever and anon bring the above question to the reader's mind.

This is by no means to say that the book is badly written. On the contrary, the style is agreeable and not devoid of the *esprit* which is rarely wanting to French authors. The exploration of unfamiliar regions may be profitably described by travellers who have no special qualifications for the task they have undertaken, and the most well-worn paths may be invested with fresh interest by the touch of genius, or by the skill of the specialist; but when, as in the work before us, neither of these conditions obtains, the result cannot be said to be satisfactory. Myths picked up at second-hand, like the following, are set down in sober earnest as actual fact.

"Les vents brûlants soulèvent parfois des nuages de poussière si épais qu'ils suffoquent et font périr des caravanes entières, qui périssent de cette horrible façon" (p. 155). Our readers will be surprised to learn (p. 250) that "l'école anglaise protestante" (Church Missionary Society's School at Julfa) "reçoit du gouvernement de la reine Victoria de solides envois de fonds," and will wonder under what head of the Budget those solid remittances are grouped. To point out all the errors into which the writer has innocently fallen would, however, be a wearisome and futile task. Coming so soon after the able and exhaustive work of "Sir Curzon," to which the writer refers, not to speak of the lively and beautifully illustrated work of his own countrywoman, Madame Dieulafoy, this book is scarcely wanted.

Ten Years in Manchuria: A Story of Medical Mission-Work in Moukden (1883-1893). By D. Christie, L.R.C.P., L.R.C.S.Ed., Medical Missionary, U.P. Church of Scotland. Paisley: J. and R. Parlane, n.d. Pp. 106.

The title of this book sufficiently explains its nature. It has a two-sided interest, missionary and medical. The importance and value of Dr. Christie's work are clearly shown by the statistics, which include a statement of the steadily increasing number of patients that take advantage of his medical skill, and a table of the diseases treated and operations made. There are a few illustrations, including a portrait of General Tso, who was killed at the battle of Ping Yang, September 15th, 1894. In an interesting footnote he is described as "a brave General, a strict disciplinarian, and a terror to law-breakers." He took a great interest in all charitable and benevolent schemes, and "will be missed by all Moukden, and by none more than the missionaries."

Bibliothèque de l'Histoire contemporaine. La Colonisation Française en Indo-Chine. Par J.-L. de Lanessan, ancien Gouverneur-Général de l'Indo-Chine, avec une carte de l'Indo-Chine. Paris: Felix Alcan. Pp. viii + 360.

Any new work on the above subject by this distinguished author will be read with interest, and the present volume, besides being in some sort a continuation of his *L'Indo-Chine Française* (see vol. v. p. 214 of this Magazine) has also the personal interest of a *pièce justificative*. Under the "Décret organique" of April 1891, M. de Lanessan had a much freer hand than his predecessors, of whom "de 1883 à 1891 il y a eu vingt Résidents Généraux ou Gouveneurs Généraux," (to say nothing of minor appointments); the result being, naturally, "une anarchie profonde." These high officials were hampered by the control of the authorities and a prey to intrigues in Paris, where the situation, as the writer explains, was entirely misunderstood. His first care was to regain the confidence and restore the prestige of the mandarins, who are the natural accepted rulers of the people; to allay the violent jealousies of the civil and military departments, and to put a stop to the continual aggressions upon the central province of Assam by the French authorities in Cochin China and Tongking, which in fact are not separate or rival states, but provinces of the Annamite Empire. He attributes to this rational and conciliatory policy the remarkable increase of revenue during the four years.

He approves generally the principle of a protectorate as compared with annexation; the employment of native functionaries is economical, and the margin of revenue thus saved can be employed in public works.

M. de Lanessan speaks very candidly of the sufferings inflicted on the people of the northern frontier and elsewhere through ignorance of the true condition of affairs; and in this connection it may be noted that the terms "rebel" and "pirate" depend for their force on the point of view from which they are applied.

The details which the author gives of administration, revenue, trade, and production are full of interest. Evidently the development of the country, though according to the writer proceeding apace, is not yet far advanced. He makes various practical suggestions of new staples and industries which might be encouraged, carefully limiting his recommendation, however—and this may sound strange to some of our readers—to products which will not excite the jealousy of the "Metropole" by coming into competition with the home producer.

History of British Columbia from its Earliest Discovery to the Present Time. By Alexander Begg, C.C., F.R.C.I. Illustrated. Toronto: William Briggs, 1894. Pp. xviii + 568.

A History of British Columbia consisting of 560 closely-printed octavo pages might well strike terror into the heart of a conscientious reviewer; but, opening the book at random, we soon discovered that the task of reading it would be a most pleasant one, and we have no doubt that other readers will agree with us. Mr. Begg traces the history of British Columbia down to the present time, from the days when Captain Cook first landed there in 1778, through the period of the fur traders, properly beginning with Alexander Mackenzie's memorable journey in 1793, and the Colonial period, which dates from 1849. Although he chronicles the most minute details of its history, he is never dull; and there is so much of the personal and purely human element in the narrative, in the shape of adventurous deeds and daring enterprises, that the book often reads like a romance. The author deserves great praise from the student of geography for the very full and interesting account of the natural features, the resources and the social condition of one of the finest provinces of the Dominion. Scotchmen especially should feel grateful to Mr. Begg for bringing home to them the fact that, if to-day British Columbia is among the most prosperous and promising portions of the Empire, it is almost entirely due to the enterprise and energy of their own kinsfolk.

The book is very well got up, and contains numerous small but good illustrations, principally portraits.

Beiträge zur Methodik der Erdkunde als Wissenschaft wie als Unterrichtsgegenstand. Herausgegeben von Dr. Richard Lehmann, a.o. Professor der Erdkunde an der Akademie zu Münster i.W. Heft 1. Halle a.S.: Tausch und Grosse. 1894.

This publication, which is to appear at irregular intervals, is also a first supplement to Professor Lehmann's *Vorlesungen über Hülfsmittel und Methode des Geographischen Unterrichts*, which was only recently completed. The first volume dealt with geographical apparatus, models, maps, pictures, etc., and with map-drawing; this supplementary part is more concerned with methods of arranging and presenting the subject.

There are three papers by different authors in this new Heft, in one of which Dr. Ule describes how he teaches the classes of practical geography at Halle. In summer much of the work is carried out in the field, where surveys are made, first without any instruments, and then with simple apparatus, and lastly with all the appliances and refinements of a modern survey. The determination of

astronomical positions and of heights is studied practically, as well as the elements of hydrographical and magnetic surveys. In winter the practical work is done indoors, and consists in a very complete course of practice in all kinds of map-drawing and reproduction, and in the use of mathematical geographical apparatus. The paper is a very useful one, and whenever our universities come to realise that there is such a subject as geography, which deserves a place within their walls, and appoint some one to teach it, this geographer will find many valuable hints in Dr. Ule's account of how he conducts classes in practical geography.

It seems a matter of exceptional difficulty for the universities in this country, which has more practical interests in the study of geography than any other, to recognise the study of it; and it can be explained only by an ignorance of what geography means, or by an indifference to actual practical as well as scientific interests. The other day one in authority explained that to specially study geography was to waste time, for all that was of any interest or value was given in an occasional lecture by the economist, the historian, the biologist, or the geologist!

If in this country we cry for one professor of Geography and as yet find none, in Germany, having one already, they cry for two, as one cannot overtake the work of the chair.

About the way in which geography has to be divided there has been much controversy centering round a series of papers by Dr. Hirschfeld, Professor of History in Königsberg, who wishes one teacher for General Physical Geography, and another for Historico-Political Geography. Professor Hermann Wagner has already criticised this classification in the 14th volume of the *Geographisches Jahrbuch*, but Professor Kirchoff of Halle does so more fully in the present publication. He says that, although it is possible to separate the physical and human elements in general earthlore, in the study of any special region they cannot be so separated. This regional geography is classified in Professor Lehmann's paper, *Zur Beschaffung des heimatskundlichen Unterrichtsmaterials*, which is the longest and most important communication in this supplement to his book. He divides it into two parts, which, however, should not be studied separately—(1) Physical; (2) Human.

The Physical Geography of a region should be studied in the following order:—

1. The Surface Configuration, the Constitution of the Soil, the Mineral Wealth.
2. Climate.
3. Water. Springs and Surface Water. Burns and Rivers. Lakes and Seas. Marshes.
4. Plants, Wild and Cultivated.
5. Animals, Wild and Domesticated.

The order of study of the human side of geography is much more open to criticism, and the difficulties of classification become very great. To Prof. Lehmann the following scheme seems best:—

1. The General Anthropo-Ethnological Relations (Volkskunde), first of all in their gradual development, and secondly in their actual conditions.
2. The Origin and Development of the District and its History.
3. Administrative, Economic, Production and Exchange, Population Statistics, and the Condition of the Region as evidenced by its Higher Culture.

Such a programme for the study of a region shows that geography is not a matter of remembering topographical details, but of explaining the interrelationship of many diverse facts to which all must give heed who would know something of the world around them.

Quellenkunde. By Professor von Hippolyt J. Haas, Ph.D. Leipzig: J. J. Weber, 1895. With 45 Cuts. Pp. vi + 220.

In this book Professor Haas has collected into a volume of convenient size a large mass of information relating to springs, wells, and the circulation of underground waters in general.

The subject treated in the book has long been regarded as an important branch of economic geology, which can only be thoroughly understood by a practical geologist. Dr. Haas has, therefore, done well to preface his book with some account of such sections of geology as are more immediately connected with the circulation of underground waters—for it is better to possess even the small amount of geological knowledge that can be obtained through the medium of books, than to know nothing of it at all, as is too often the case with many so-called "practical" men.

After giving a description of the relation between the geological structure of a district and the underground circulation of water in it, the author goes on to treat of the various kinds of springs, thermal waters, mineral springs, geysers and allied phenomena. A chapter near the end of the book is devoted to the important subject of the art of finding water, in which the author introduces some observations upon the divining-rod, which, as the readers of this magazine probably all know, continues to be used by cunning impostors in out-of-the-way parts of Britain even to this day. Another chapter of the book deals with deposits of solid matter from springs; while the concluding section treats of the various modes of determining the hardness of water.

Seeing that for many years British geologists have devoted a considerable share of attention to the circulation of underground waters in connection with water-supply, one cannot but feel surprised that the names of such men as Prestwich and Whitaker are never mentioned in the book, and that no reference whatever is made to the work either of our own Royal Commission or of the equally important work in the same direction carried on for years by the British Association.

A. Hartleben's Kleines Statistisches Taschenbuch über alle Länder der Erde, 1895. Nach den neuesten Angaben bearbeitet von Professor Dr. Friedrich Umlauft. Pp. iv + 99.

A. Hartleben's Statistische Tabelle über alle Staaten der Erde, 1895. Wien, Pest, Leipzig: A. Hartleben's Verlag.

These two publications contain much the same information, but the book has tables of the railways of the whole world and of Europe, the fleets of European nations, and their national debts collected in an appendix. In the book, at any rate, the use of *etc.* in the lists of Colonies seems to us to be carried rather too far. It includes, for instance, the British South Africa and the Niger Companies' territories, British Bechuanaland, and, under French Colonies, the important islands of Guadeloupe and Martinique. The error we noticed in the *Tabelle* for last year of putting yellow in our national flag is repeated.

The Natal Almanac, Directory, and Yearly Register, 1895. Pietermaritzburg: P. Davies and Sons. London: Street and Co. Pp. xxviii + 784 + 180.

The *Almanac* continues to increase a little in size, but is still a handy volume. The information it contains is of the most varied description, and useful both to the commercial man and the immigrant. We should like to have learnt something of the present state of the tea industry, an occupation of comparatively recent origin in Natal.

In der Fünfmillionen-Stadt. Kulturbilder aus dem heutigen England. Von Gustaf F. Steffen. Leipzig: Peter Hobbing, 1895. Pp. 387. *Price 2 marks.*

English character seems a puzzle to foreigners. Recently M. Alphonse Daudet arrived in London from Paris, and, after a stay there, expressed himself highly pleased with the men of England but less so with Englishwomen. Now we have the opinion of Herr Steffen, a Swede, who, after visiting London, disparages Englishmen but praises Englishwomen to the skies. Take this paragraph from his book on London, "The Five Millions' City":—"Foreigners are nearly unanimously of opinion that English society is so stiff, ceremonious, and spiritless, that it is almost unendurable to one coming from the Continent. This is principally due to that mysterious phenomenon known as 'English National Character,' but also, in the second place, to the faultiness of English male society. That it is not worse, we have to thank the English ladies. Albion's beautiful daughters, in so far as conversation is concerned, are altogether different from Albion's manly, but dull, awkward, and conceited sons. Continental observers of the highest intelligence have invariably awarded to English ladies the palm among European women." On the principle of seeing ourselves as others see us, Herr Steffen's book is well worth reading; and although he is not so vivacious, he is quite as sharp-sighted as Max O'Rell, and an English translation would doubtless meet with success. Both he and M. Daudet, however, would do well to remember Max O'Rell's warning, that it would be as unfair to judge the French by a visit to Paris, as to judge the English after a visit to London.

On Duty under a Tropical Sun. By Major S. Leigh Hunt and Alexander S. Kenny, M.R.C.S.E., A.K.C. Third Edition. London: W. H. Allen and Co., n.d. Pp. 184, and Index.

This little book is devoted to the description and treatment of many tropical diseases and minor emergencies, supplemented by some useful hints on diet, clothing, and equipment for travellers in tropical climates. The issue of a third edition proves that the book has hitherto been successful, though we think that the authors might have introduced some improvements upon the former edition of 1883, of which this is a reprint.

On the whole we can commend the hints which have been given for the treatment of various diseases, but in some places much has been left to the knowledge of the reader in the selection and application of a remedy. In dealing with fractures and dislocations the authors would have been well advised had they introduced a few inexpensive illustrations, as the description given is hardly sufficient for the purposes of their treatment.

The list of medicines is not very complete, omitting very many of the drugs spoken of in the foregoing pages, neither is mention made of the very portable forms of compressed drugs which form such a useful addition to the modern armamentarium.

On page 110 the carbolic lotion should doubtless be 1 in 40 instead of 1 in 20 as there stated. Also we notice that the advice with regard to the prevention of ingrowing toe-nail is not in accordance with the generally accepted opinion.

Au Pays de Paul et Virginie. Par Jules Leclercq. Paris: Plon, 1895. Pp. 312.

The "Country of Paul and Virginia" is the island of Mauritius, which was once a French possession, but was ceded to Britain in 1814. M. Leclercq calls it "the

Queen of the Indian Ocean—the Pearl depicted by the divine pencil of Bernardin de Saint-Pierre." Leaving Southampton on 3rd June, the author reached Mauritius on 6th August 1893. He found French still the ruling tongue there. Port Louis, the capital, has become very unhealthy since the days of Saint-Pierre, and no white man passes the night there from fear of fever. The only hotel in Mauritius is consequently at Curepipe, on the highest plateau (1832 feet) in the island, and one hour by train from Port Louis. Curepipe has become the island sanatorium, contains 12,000 inhabitants, and is slowly ousting Port Louis from the position of capital. The author ascended the "Pieter Booth" mountain (2690 feet), the remarkable summit of which remained inaccessible till 1790, as it consists of a bare pinnacle (48 feet high), up which the author hauled himself by a rope fastened by an Indian. The "Hindoo Invasion" of Mauritius has led to the island becoming more densely peopled than Belgium, there being 534 inhabitants to the square mile. According to the census of 1891, Mauritius contains 256,000 Hindoos out of a population of 370,000. The Hindoo has replaced the Negro whom the planter formerly employed. Even the Creoles are disappearing before the Hindoo, so that "one day the pearl of the Indian Ocean will belong to the Indian races." Like M. Leclercq's book on South Africa (*rev.* p. 320), this one is entertaining as well as instructive. The illustrations are indifferently printed, but the map (by H. Rollet, Paris) is clear, although containing the old-fashioned "caterpillar" delineation of mountains.

Sir John Franklin and the Romance of the North-West Passage. By G. Barnett Smith. London: S. W. Partridge and Co., n.d. Pp. 160. *Price* 1*s.* 6*d.*

In this small book the author has given a succinct life of Sir John Franklin, together with an account of the various expeditions sent in search of him. Its publication is well-timed, and, though it contains nothing new, it gives a facsimile of the last document relating to Franklin, which was found in a cairn by Lieutenant Hobson, as well as several illustrations. But it is unaccompanied by a map.

Illustrated Particulars of the Stitchel Estates in the Counties of Roxburgh and Berwick. London: E. and H. Lumley, 1895. Pp. 21. Map. *Price* 10*s.* 6*d.*

This illustrated account of the Stitchel estates has been prepared with a view to their sale by Messrs. Lumley, and is got up in a handsome style. It contains a descriptive account of Stitchel House, a report by Mr. John Robertson, Chamberlain to the Duke of Atholl, and a detailed account of the lands and rental of the estates. There are five photographic views of the Mansion and Estate of Stitchel. The map, which is from the Ordnance Survey, shows plans of Stitchel, Stonefold, Hadden, and Kaimflat.

Livingstone in Africa. By the Hon. Roden Noel, with Illustrations by Hume Nisbet, and Preface by E. H. Hickey. London: Ward and Downey, 1895. Pp. xx + 138. *Price* 10*s.* 6*d.*

The first edition of this work appeared in 1874, the year after Livingstone's death. The new issue is beautifully printed and the illustrations are excellent. Mr. Roden Noel, as stated in the preface, was himself a traveller, having been the first, in company with Mr. Cyril Graham, to visit the oasis of Kur-Kur, and therefore knew by experience something of the romance of life among the solitudes of primeval nature.

MAPS.

WORLD.

THE RELIGIONS OF THE WORLD, with the Stations of the London Missionary Society. *Price 6d.; mounted on cloth, with rollers, and varnished, 1s. 6d.*

George Philip and Son, London and Liverpool, 1895.

We have little to say about this map except that the shades of red used for Protestants, and Protestants with 25-50 per cent. of Roman Catholics, are too much alike. A diagram shows the proportions of the adherents of the different religions. The terms "Pagan" and "Heathen" are not sufficiently distinctive.

EUROPE.

COUNTY OF SURREY. New Reduced Ordnance Survey Map of the ——. By John Bartholomew, F.R.G.S. Scale: two miles to an inch. *Price, cloth, 2s.*

W. H. Smith and Son, London.

Similar in style to the Scottish series. Altitudes are shown by a scale of eight tints.

AFRICA.

AFRIQUE, CENTRALE ET AUSTRALE. Par le Général Niox. (1·10 sur 1·80 m.) Échelle de 1 : 8,000,000. *Price 6 Fr.*

Librairie Ch. Delagrave, Paris.

Maps of countries where changes are continually taking place should be dated. This map of Africa is full of detail, and contains several excellent insets of the Upper Niger, the Guinea coast, the Cape, etc. But it is by no means up to the present date. The Anglo-German boundary around Yola and up to Lake Tsad does not appear, nor the Franco-German boundary, nor the new boundaries of the Congo State along the Mbomu and in the south, etc.

A very useful innovation is the marking of the dates of the treaties regulating the boundaries. The execution is good and the colouring tasteful.

DEUTSCH OSTAFRIKA, Karte von ——. Konstruirt und gezeichnet unter Leitung von Dr. Richard Kiepert. Im Auftrage und mit Unterstützung der Kolonial-Abtheilung des Auswärtigen Amts herausgegeben. Massstab 1 : 300,000.

Geographische Verlagshandlung Dietrich Reimer, Berlin.

We have received three sheets of this great work, namely, the Eyassi lake, Tabora, and Turu. The whole map will contain 29 full sheets, each 68 × 86 cm., besides eight to ten supplementary sheets. By this publication Germany sets an excellent example to the other European Powers in Africa. The work will be noticed more fully in a later number of the Magazine.

KAMERUN, Skizze des Küstengebietes von ——, nach den Vermessungen der Kaiserl. Marine, den geologischen Beobachtungen und Aufnahmen von Bergassessor B. Knockenhauer 1893-94, und den Routenaufnahmen von Missionar J. Autenrieth 1894, und der schwedischen Reisenden P. Dusén 1891-92, und Y. Sjöstedt 1890-92. Massstab 1 : 500,000.

Mitteilungen aus den deutschen Schutzgebieten, Bd. viii. Heft 1.

AMERICA.

NICARAGUA, Geologische Karte des nördlichen Teiles der Republik ——. Auf Befehl Sr. Exc. des Präsidenten Dr. Rob. Sacasa in den Jahren 1892 und 1893 aufgenommen und gezeichnet von Dr. Bruno Mierisch. Massstab 1 : 700,000. Nebenkarten : 3 geologische Profile.

Petermanns Mitteilungen, Tafel 4, 1895.

BRITISH GUIANA AND VENEZUELA, Part of ——. Scale 1 : 1,500,000 (23·67 miles = 1 inch). *The Geographical Journal, April* 1895.

AUSTRALIA.

AUSTRALIA, Commercial Map of ——, 1895. By J. G. Bartholomew, F.R.G.S. Scale, 1 : 6,000,000. *Price, cloth*, 3*s.*; *paper*, 2*s.*

John Bartholomew and Co., Edinburgh.

All the latest information seems to be incorporated in this map. In Western Australia, and especially in the Kimberley Division, there is a large amount of new detail. The steamer routes, telegraph and railway lines are distinctly marked, and there are several good insets of towns and ports. The map includes also British New Guinea, where the new Anglo-Dutch boundary is shown; the mouth of the Bensbach river, the starting-point of the boundary, should have been marked.

ATLASES.

COMPANION ATLAS TO CHAMBERS'S CONCISE GAZETTEER OF THE WORLD.

W. and R. Chambers, Lim., London and Edinburgh, 1895.

The *Gazetteer* was noticed on p. 157. The Atlas corresponds in form, and the maps, though small, are well chosen, accurate, and clearly printed. For ordinary readers, and those who use the *Gazetteer*, the information contained on these sheets will be all that is required.

OESTERREICHISCHEN ALPENSEEN, Atlas der ——, mit Unterstützung des hohen K. K. Ministeriums für Cultus und Unterricht herausgegeben von Dr. Albrecht Penck, Professor der Geographie an der Universität, Wien, und Dr. Eduard Richter, Professor der Geographie an der Universität, Graz. 1. Lieferung : Die Seen des Salzkammergutes.

Ed. Hölzel's Geographisches Institut, Wien, 1895.

The first instalment of this beautiful atlas contains 18 maps and 100 sectional diagrams drawn by Dr. Johann Müllner, chiefly from the soundings of Hofrath Dr. F. Simony. The contours of depths are drawn for every 10 mètres, those of fifty mètres being thicker. The contours of the surrounding land are also drawn, at intervals of 20 mètres, so that the whole basin of each lake may be seen at a glance. The scale is in most cases 1 : 25,000, but in the case of one or two of the larger lakes it is 1 : 10,000. Colours are also used to distinguish the depths and heights.

The methods employed for the construction of the contours is explained, and a geographical description of the lakes is given, by Dr. Müllner in the *Geographische Abhandlungen*, Bd. vi. Heft 1.

OROGRAPHICAL MAP
OF
SUTHERLAND AND CAITHNESS

Scale 1 inch = 10 miles.

0 5 10 15 20

Pentland Firth
Cape Wrath
SUTHERLAND
CAITHNESS
Loch Inchard
Loch Laxford
Loch Eriboll
Loch Hope
Loch Shin
Loch Naver
Loch Loyal
Loch Assynt
Loch Stack
Loch Shiel
Loch Leven
Loch Linnhe
Loch Lochy
Loch Arkaig
Loch Eil
Loch Sunart
Loch Moidart
Loch Shiel
Loch Ailort
Loch Nevis
Loch Hourn
Loch Duich
Loch Alsh
Loch Carron
Loch Kishorn
Loch Torridon
Loch Ewe
Loch Maree
Loch Broom
Loch Fleet
Loch Brora
Loch Naver
Loch Loyal
Loch More
Loch Shin
Loch Assynt
Loch Stack
Loch Inchard
Loch Laxford
Loch Eriboll
Loch Hope
Loch Leven
Loch Linnhe
Loch Lochy
Loch Arkaig
Loch Eil
Loch Sunart
Loch Moidart
Loch Shiel
Loch Ailort
Loch Nevis
Loch Hourn
Loch Duich
Loch Alsh
Loch Carron
Loch Kishorn
Loch Torridon
Loch Ewe
Loch Maree
Loch Broom
Loch Fleet
Loch Brora
Dunnet Hd
Duncansby Hd
Stroma
Pentland Skerries
Thurso
Wick
Helmsdale
Brora
Golspie
Dornoch
Dornoch Firth
Tarbat Ness
Tain
Bonar Bridge
Lairg
Durness
Tongue
Kinlochbervie
Scourie
Lochinver
Ullapool
Gairloch
Kyle of Lochalsh
Kyle Rhea
Glenelg
Mallaig
Arisaig
Morar
Mallaig
Fort William
Ballachulish
Glencoe
Kinlochleven
Onich
Corpach
Caledonian Canal
Fort Augustus
Invergarry
Spean Bridge
Roy Bridge
Kinlochmoidart
Strontian
Acharacle
Salen
Tobermory
Aros
Craignure
Oban
Connel
Ballachulish
Kinlochleven
Onich
Corpach
Fort William
Caledonian Canal
Fort Augustus
Invergarry
Spean Bridge
Roy Bridge
Kinlochmoidart
Strontian
Acharacle
Salen
Tobermory
Aros
Craignure
Oban
Connel
OROGRAPHICAL MAP
OF
SUTHERLAND AND CAITHNESS
Scale 1 inch = 10 miles.
0 5 10 15 20

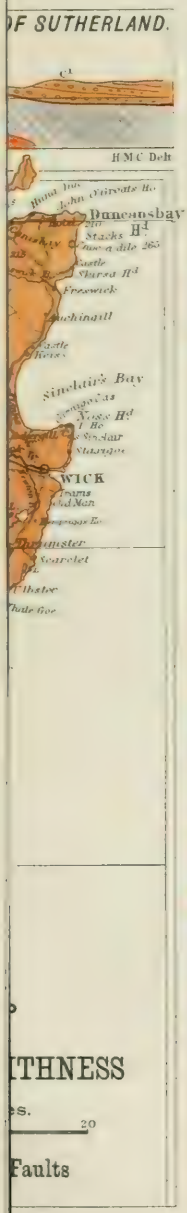
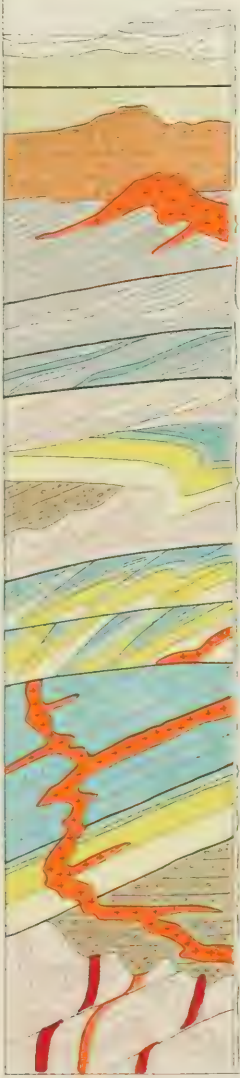
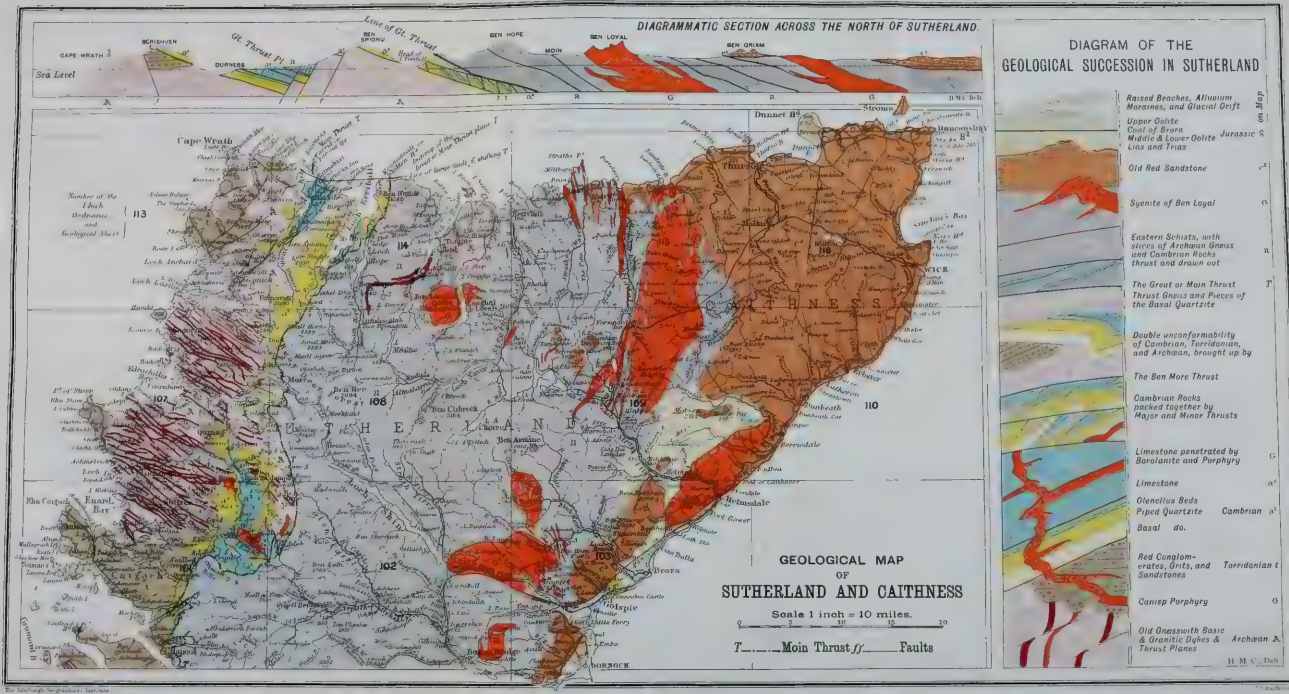


DIAGRAM OF THE GEOLOGICAL SUCCESSION IN SUTHERLAND



		on Map
Raised Beaches, Alluvium Moraines, and Glacial Drift		
Upper Oolite Coal of Brora Middle & Lower Oolite Lias and Trias	Jurassic	J
Old Red Sandstone		c^2
Syenite of Ben Loyal		G
Eastern Schists, with slices of Archæan Gneiss and Cambrian Rocks thrust and drawn out		a
The Great or Main Thrust Thrust Gneiss and Pieces of the Basal Quartzite		T
Double unconformability of Cambrian, Torridonian, and Archæan, brought up by		
The Ben More Thrust		
Cambrian Rocks packed together by Major and Minor Thrusts		
Limestone penetrated by Borolanite and Porphyry		G
Limestone		a^2
Olenellus Beds Piped Quartzite Basal do.	Cambrian	a^1
Red Conglomerates, Grits, and Sandstones	Torridonian	t
Canisp Porphyry		G
Old Gneiss with Basic & Granitic Dykes & Thrust Planes	Archæan	A

H. M. C., Delt.


DIAGRAMMATIC SECTION ACROSS THE NORTH OF SUTHERLAND.
CAPE WRATH
DURNESS
BEN HOPE
BEN LOYAL
MOIN
BEN GRIAM
Sea Level
Line of Gt. Thrust
Gt. Thrust Pl.
DIAGRAM OF THE GEOLOGICAL SUCCESSION IN SUTHERLAND
Raised Beaches, Alluvium Moraines, and Glacial Drift
Upper Oolite
Coal of Brora
Middle & Lower Oolite
Lias and Trias
Jurassic
Old Red Sandstone
Syenite of Ben Loyal
Eastern Schists, with slices of Archæan Gneiss and Cambrian Rocks thrust and drawn out
The Great or Main Thrust
Thrust Gneiss and Pieces of the Basal Quartzite
Double unconformability of Cambrian, Torridonian, and Archæan, brought up by
The Ben More Thrust
Cambrian Rocks packed together by Major and Minor Thrusts
Limestone penetrated by Borolanite and Porphyry
Limestone
Olenellus Beds
Piped Quartzite
Cambrian
Basal do.
Red Conglomerates, Grits, and Sandstones
Torridonian
Canisp Porphyry
Old Gneissoith Basic & Granitic Dykes & Thrust Planes
Archæan
H M C. Del
Cape Wrath
Durness
Loch Eriboll
Loch Laxford
Loch Inchard
Kyle of Tongue
Tongue
Melvich
Strathy Pt.
Dunnet Hd
Thurso
Wick
Caithness
Sutherland
Ben Clibreck
Ben Armine
Loch Naver
Loch Shin
Lairg
Golspie
Brora
Helmsdale
Berriedale
Dornoch
Tain
Ross-shire
Enard Bay
Rhu Coigach
Ullapool
Loch Broom
Gairloch
Loch Maree
Loch Torridon
Loch Carron
Loch Kishorn
Loch Alsh
Kyle Rhea
Glenelg
Kyle of Lochalsh
Skye
Raasay
Applecross
Strome
Number of the 1 Inch Ordnance and Geological Sheet
GEOLOGICAL MAP
OF
SUTHERLAND AND CAITHNESS
Scale 1 inch = 10 miles.
T——Moin Thrust ff——Faults

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

NOTES ON THE GEOGRAPHY, GEOLOGY, AGRICULTURE, AND ECONOMICS OF ICELAND.

By H. J. Johnston-Lavis, M.D., M.R.C.S., B.Ès.Sc., F.G.S., Etc.

Prof. (pareg.) of Vulcanology in the R. University of Naples.

Iceland stands unique in that it is an island touching the Arctic circle, and therefore within a region of intense denudation; at the same time this area, larger than Ireland, owes its whole origin to volcanic action, and all its rocks are directly or indirectly due to igneous processes at the surface. Its geography is therefore so interlinked with its geology that the two go hand in hand.

In the summer of 1890 I was most kindly invited by Dr. Tempest Anderson of York to accompany him on a trip to Iceland, and I take this opportunity of sincerely thanking him. Our object was to travel eastwards along the south coast as far as the renowned Skáptárdalr, examine the seat of the great eruption of 1783, and returning by the mountain backway, rarely traversed, behind the triplet of the Myrdals Jökull and its fellows, examine Hekla, the Geyser district, and Thingvellir. In addition we were able to devote some days to the Reykjanes peninsula, with an excursion to Hengill. It will thus be seen that we traversed a very considerable distance, and I shall only attempt in these lines to give a sketch of some of the principal, though rough, observations that could be carried out in such a journey. I shall endeavour to compare the volcanic phenomena as exhibited in the part of Iceland we examined with the other three active volcanic districts of western Europe which I had the good fortune to have visited within the year previous to our trip, and with most of which I am intimately acquainted. It has now become an old superstition that two great phases exist in the physical history of Iceland, and most authorities I have read on the subject,

without saying distinctly that such was the case, lead one to suppose that a considerable period of inactivity separated the earlier from the later great eruptive displays. I would therefore say that, so far as I could see, there seems to have been no break whatever—that, in fact, eruption has succeeded eruption whether the area was covered with the great ice-sheet of the Glacial Period or not.

South of Reykjavik, on the road to Hafnarfjördhr, comparatively old lava beds are met with, and high up on the sides of the creeks water-deposited agglomerates and other evidence of relatively recent emergence are obvious. As we approach Hafnarfjördhr, we encounter and traverse a comparatively recent lava stream, and soon after quitting that town we plunge into the great Gullbringu Sýsla district, with that of Thingvellir and Skjaldbreidh, for the greater part a vast lava desert 125 km. in length and extending away to the south-west for another 30 or 40 beneath the sea, so that we may credit it with a length of at least 150 km., and a breadth of 25 km.—an area equal to several good-sized English counties. Its general shape is elongated and curved, so that while it follows roughly a north-east to south-west trend from the great cone of the Skjaldbreidh at the north to the Fuglasker islands, where volcanic disturbances are frequent, its southern edge is convex. Its northern extremity tends to run more north and south and the maritime end to run more east and west. The interest of this we shall see when we study the general tectonics of the entire island. The whole of this region is characterised by evidence of intense and still persistent volcanic activity. Nearly all of it is covered by recent lavas, some as fresh-looking as if they had been emitted only a few years ago, and most dating back not much earlier than the colonisation of the island in the tenth century. Scattered over this region there are said to be upwards of fifty solfataras. Winding through it, always following the same direction and always tending to the same curves, are the great *gjás* or rifts, some of which may be followed for 20 or 30 km., especially in the Reykjanes peninsula. The volume of some of these lava fields is enormous, and as we cross from Hafnarfjördhr to Krisuvik, we are astonished by the enormous outflows, some of which have spread over dozens of square kms., and whose actual limits would require careful surveys to determine. On this part of the journey the relationship of the newer lavas to old tuff hills and lavas of more ancient date is well seen, the former winding in and out of the valleys and abutting against the escarpments cut in the older rocks. In fact it is on the slopes of these older rocks, facing south, that some of the clumps of brushwood grow that represent the woodland of the island of frost and fire. These newer lavas in this region have fairly rough surfaces, rarely corded, but covered by not very porous masses of scoriaceous rock, showing that no inconsiderable quantity of H_2O was contained in the lava at the time of its emission. When we crossed the Reykjanes peninsula, travelling northwards from Stadhr, the whole way was over such lavas, interrupted here and there by cones of varying dimensions, some being considerable volcanoes, which mark the points of exit of these lavas. These cones are composed of scoria-cakes, and though of rather a dense kind, they indicate that considerable violence accompanied

No. 1,

the ejection of the lavas. The low gradients that large areas of the flows present demonstrate their great fluidity, no doubt due to their initial high temperature at the time of outflow and their basic nature. Their surfaces are now thickly clothed by a luxuriant growth of lichens and mosses, which often attains a thickness of a decimètre or more, and renders walking over the surface much more easy, though the ground is sometimes treacherous, than over similar lavas at Etna and Vesuvius, where the *Stereocaulon Vesuvianum* makes a very poor show as a lichen by the side of its luxuriant Arctic rivals. The peculiar greenish-grey sheen of such a lichen-covered surface produces a striking effect in bright sunlight near sunrise or sunset. Could some use be made of this material besides as fuel, for which it is not well suited, a large and profitable industry might spring up to help the poor Icelanders in their hard struggle for existence.

The great *gjás* or rifts that have been mentioned are, of course, later than the lavas they traverse. They are great fissures trending fairly straight over wide areas, for a distance, say, of 500 m., though zig-zag for short distances owing to the absence of homogeneity in the lavas, and consequent irregularity of fracture. Their breadth varies, but averages from 1 to 3 m. Their depth is unknown, for they can rarely be sounded beyond 20 or 30 m., as falling blocks have choked them, and the snow is never thawed in summer below this depth. The accompanying photograph exhibits a good specimen, with the snow in its bottom, and is part of the Hrafnagja in the Reykjanes peninsula (Photo. No. 1).

Evidence of solfataric activity is most marked, though to some extent localised in definite areas. Two of these centres we were able to examine in detail, namely, those of Krisuvik and Cape Reykjanes. The foci at Krisuvik are traversed by the road to that farm. Here a great number of fumaroles are now smoking, depositing sulphur, halotrichite and other alums, with gypsum and a little fiorite. A company was started some years ago to collect the sulphur, but the expenses of transport were so great that it soon failed. Here occur very interesting boiling springs.

The violent bubbling and splashing is not due to the escape of carbonic acid or any other gas as in an intermittent spring (*Sprudel*), but is actually caused by ebullition, and therefore the spring is really a small geyser. There were several of these in different grades of violent activity, and I was fortunate to obtain some good photographic records of them. Their mineral contents are very small. There were also some good mud springs, as they are called, but the less elegant though more expressive name of the Devil's Paint Pot is more applicable to them. One of them was a deep, bell-shaped hollow, with a blue-grey mud bubbling up quite hot at the bottom. This crater-like hollow is really due to the escape of the hot vapour and sulphuretted hydrogen that bubbles up gently under ordinary conditions from its bottom, but at times escapes with explosive violence. The blue mud is nothing more than the neighbouring rock in a fine state of comminution, mixed with a large quantity of sulphur and sulphides deposited from, or generated by, the escaping vapours which constantly churn up the mud into a homogeneous paint-

like paste, and project splashes of it against the crater sides and even beyond its border. The effects of the fumarolic action on the surrounding rocks is very marked by the genesis of all the usual deposits of sulphur, sulphides, sulphates, gelatinous silica and pulverulent deposits of alumina, and hydrosilicates variously coloured by different combinations of iron. At one point we obtained a remarkably brilliant red bole almost rivalling cinnabar in its intense coloration.

At Cape Reykjanes, close to the lighthouse station, is another solfatara, perhaps as important as that of Krisuvik. Here all stages from springs of clear boiling water to hot jets and thence to Devil's paint-pots can be studied. In fact, small lakelets occur with almost clear boiling water in the centre, milky-looking water farther out with innumerable bubbles of gas, and beyond this thick deposits of sulphurous mud with escaping gases. In spite of my familiarity with such man-traps, one of my feet suddenly sank through a hardened crust up to my knee in this mud; but I was able fortunately to save myself and get off with a mineralised mud poultice over the whole of my leg applied hotter than is usual for medicinal purposes. Close at hand to these last-mentioned springs are the remains of an old geyser cone composed of the finest siliceous sinter I have seen in any collection. The geyser is quite extinct and the cone and basin much ruined. We were able to collect and bring away some beautiful specimens of the ripple-marked sinter, ranging from pure white through pink to dark red, and exhibiting in a striking manner the deposition of this interesting substance.

It is in the south-western extremity of this district that volcanic activity seems at present to be mostly concentrated. Earthquakes are very common about Cape Reykjanes, and the name Fuglasker or fire-islands clearly refers to the frequent submarine volcanic disturbances in this neighbourhood. It is not unlikely that the great rifts that attain their greatest perfection between Reykjanes and Kálfatjörn are the great fractures that every earthshock enlarges and, possibly, extends. It would well repay the trouble to carry out a series of measurements and to fix marks to the lips of these rifts to show whether they are undergoing any change. Such an observation station situated at the south-western extremity of the Hauksvörtdhugjá would cost little, for it could be looked after by the lighthouse keeper at Reykjanes, and it might afford most valuable and instructive data.

What these rifts are really due to is not an easy matter to determine. I could see no signs of shifting or faulting horizontally, and very little vertically, though the rough lava surfaces through which the fissure runs prevent any very accurate determination of small displacements. In this respect, together with the fact that these rifts gape and are not jammed together, they differ absolutely from faults, which are really the planes of differential movements. I feel inclined, myself, to believe them to be great axial fissures along the ridges of anticlinal folds, for they correspond with the usual trend of the great ridges and synclines, with the lines of drainage, and with the chains of volcanic vents. Such synclinal folds may be due to true tectonic movements, or to the formation of great elongated laccolites. Were they simply due to tectonic

foldings, we should rather expect the *gjas* to run along the middle of such folds, and the chain of volcanic vents to run parallel, but in the flanking synclinals. I am therefore tempted to look upon these *gjas* as great axial fissures over elongated laccolites that are gradually being filled from below, and from which at times emissions of lava take place along the great hump. As the filling goes on from below, the rifts extend, accompanied by fracturing and earthquakes.

We thus see that the rifts are formed simultaneously with the shocks, *but are not due to the shocks*, as so often stated regarding earth fissures in general.

At Reykjanes cape we have an illustration of what is going on in the direction of the Fuglasker islands, as well as evidence of recent elevation. Of this latter we have innumerable examples, one of which I shall also refer to when speaking of Dyrhólaey—evidence rather contrary to the unjustifiable generalisation that all volcanic districts are areas undergoing depression. The rock upon which the Reykjanes lighthouse stands is a fine specimen of a submarine basalt cone, cut into and dissected by the sea. A considerable part of it is built up of globular basalt. This globular basalt is due to the ejection of the lava paste into the sea water as globular, pyriform, or sausage-shaped blobs, which soon crust over and sink upon those that preceded them, but are prevented from becoming soldered to them by the crust already cooled upon the surface. They have at Reykjanes been slightly flattened out by their own weight, or the pressure of those immediately above them. As they cool, a radial columnar structure is set up. At Acicastello in Sicily the lava was less plastic, and there has been little or no flattening. The process may be imperfectly imitated by injecting a very thick, coloured syrup through a fine syringe, the beak of which is plunged beneath a vessel of thin, uncoloured syrup. In such eruptions the first and more vesicular globules may reach the surface, or be projected above it, as in the recent eruption off the coast of Pantelleria. To convince oneself of the relationship of these different structures, the so-called scoria bombs of Pantelleria, with their peculiar concentric arrangement of rock of different grades of vesicularity, should be compared with the vesicular globules of Acicastello, and these with the more compact globules of Reykjanes. No doubt each submarine eruption off this south-west corner of Iceland means the building up on the sea bottom of such a cone as the lighthouse hill once was, but which has since been raised above sea-level.

Before quitting the Krisuvik region I may draw attention to other monuments of terrestrial disturbances well worthy of attention, as throwing light on the formation of certain crater lakes and on the pipernoid structure of certain rocks considered to be lavas.

Beyond the solfataras, a short distance nearer the farm of Krisuvik, we may, by ascending a little to the right or west, come to the edge of an elongated lake with very little ring or vallum around it. During our short stay I could find in its neighbourhood no *essential* eruptive ejecta; the only materials that were ejected seem to have been all of an *accidental*[1]

[1] See H. J. Johnston-Lavis on the 'Fragmentary Ejectamenta of Volcanoes.'—*Proceed. Geol. Assoc.*, vol. ix. pp. 12, and 1 pl.

nature, and to be parts of the loose alluvium, breccia, and scoria beds that this crater was drilled through. It is hardly possible to imagine a crater of such dimensions being formed by the explosion of vapour pure and simple, and the only explanation I can offer is that the pumice, if such existed, was small in quantity, very light, and carried away by a strong wind, or, by the enormous expansion in frothing, reduced to fine dust or filaments as in the thread lace pumice and Pele's hair of Hawaii. At any rate, this is a fine example of a crater lake, and, above all, one with practically no *essential* volcanic ejecta surrounding it. More interesting, however, is a series of crater lakes well seen from the path lying almost parallel to it on the east. These range down to quite small ponds remarkable for their circular form, precipitous sides, and almost total absence of crater ring or annulus. The largest and most northern is known as Grœnavatn because of the light-green colour of its water (Photo. No. 2). It is nearly circular, with very steep sides, so that its depth must be considerable at the centre. It is about as large as Lake Avernus, or perhaps a little smaller. As will be seen, it possesses little or no annulus, and I could find no indication of *essentially* eruptive ejecta along, at least, three-quarters of its circumference. In fact, the slight elevation that surrounds the lake is composed of the same miscellaneous detrital matter that surrounds the first-mentioned lake. Stretching away to the north-east is an almost horizontal mass of rock that at first sight appears to be a lava stream (well seen in the photo.). Approaching it, we find that its nearly vertical section that faces and almost overhangs the lake is some mètres in depth at its central part, thinning off at each edge, so that the whole mass is a much elongated lenticle, and therefore fusiform in section. It is a very compact, black, lava-like rock, marked, however, by horizontal flackers of brownish and more scoriaceous patches, but in the central part of the mass quite continuous and passing imperceptibly into the more compact black material above and below. So intimate is the connection that these different parts have little influence on the fracture. Towards the top and sides, and to some extent at the bottom, these brown scoriaceous veins are far more numerous, and, finally, near the surface the supposed lava is represented by loose cakes of this more scoriaceous material not welded together. This mass is not a lava stream, failing as it does to possess many of the essential characteristics. It is too horizontal to have flowed, and there are no remnants of any cone from which it could have issued. Even were we to suppose that such a cone once existed and had been blown away by the formation of the subsequent crater now filled with water, we could hardly expect such an explosion crater to have had exactly the same axis as the cone it destroyed. Besides, we should certainly expect to find some remnants of such a cone, or the materials of which it was built. Lavas do not flow from craters of explosion, and if any fluid rock had issued from that of Grœnavatn, there is no reason why it should be confined within a long and narrow radius, and, curiously enough, in the track of the prevailing wind. Finally, the slopes contradict the flow theory in the case of a mass of basic lava so narrow, so thick and unconfined in a pre-existing valley.

The real history of the Grœnavatn lake I take to be this: first, a

No. 2.

No. 5.

highly aquiferous magma blew out the crater, all or most of the eruptive material being reduced to dust and carried away by the wind. Later on, when less aquiferous magma rose from greater depths, where it had been enclosed deeper in the earth and therefore in drier rocks, and consequently had absorbed less H_2O,* it issued as blobs of scoriaceous lava, which were carried by the prevailing wind in one direction, falling along a line to the leeward of the crater. So rapid was the ejection and so small the loss of heat in vesiculation and the loss to the atmosphere that the blobs fell upon those that preceded them, to which they were re-fused or soldered, and those that followed repeated the process. As the mass increased in thickness the pressure aided the re-soldering, so that in the deepest parts the mass again became continuous, marked only by a slight variety in colour and vesicularity. Towards the sides fewer lava cakes fell, and the thickness is therefore less and the soldering-together less complete. The same imperfect union is seen towards the top of the mass, dependent likewise on the greater intervals between the ejections towards the end of the eruption, and the absence of superincumbent weight.

This pipernoid lava differs from true piperno in that the latter is a soldering together of the fragments of the same magma, but in two very extreme conditions of saturation with H_2O. The Grœnavatn rock is extremely fine-grained, and, so far as the microscope reveals its structure, it may be looked upon as a basalt. Scattered through it are numbers of fragmentary crystals, and sometimes fairly perfect laths of labradorite and bits of pyroxene. These, however, are evidently derived from fragments of a coarse crystalline gabbro-like rock, which occurs in numerous lumps, up to the size of a coco-nut or larger, enveloped in the basalt, and as bomb-like masses on its surface.

This enclosed gabbro is no doubt part of the same magma, cooled under intratelluric conditions of slowness and high pressure, and has been split up and ejected by the explosive escape from greater depths of the unsolidified portion of the same magma.

The browner scoriaceous parts of the rock mass are almost identical with the black compact portion, except that they are more vesicular, with less defined magnetite grains, and with plenty of dirty dark-brown glass.

In this great tract of recent volcanic activity of which we have been speaking, and which stretches from the Skjaldbreidh to the Fuglasker islands, it must not be supposed that the surface is entirely new. On the contrary, much of it is old and composed of old cones and platforms of lava, in the hollows and valleys of which the newer outflows have found resting-places. As we quit the Krisuvik district and wend our way along the road by Strandar Kirkja towards the mouth of the Olfusa, we are able to notice some interesting points in the tectonics of the district. Some three to five kilomètres inland from the coast we see ancient sea-cliffs cut back by the waves into the lavas, breccias, and tuffs of more ancient date. At one time the sea had in this way isolated a

* H_2O is used to denote a chemical compound without defining its physical condition, as the words steam, vapour, water, ice, are on that account often objectionable in speaking in relation to volcanic action.

large tract of land of which the culminating point is Lángahlidh. New mouths burst forth on the shelving plateaus above, and probably along the foreshore, so as to give egress to floods of lavas which have reclaimed these three to five kilomètres from the sea, aided to some extent by detrital deposits brought down from the higher ground. Much of this foreshore is little above the level of high-water, and is composed of basalts that exhibit a surface, so far as I know, undescribed, and quite different from the ragged scoriaceous or corded surface of most volcanoes. The crust is remarkably smooth and broken up into low convex segments of spheres several mètres in diameter and looking like low domes or Italian vaulted roofs. I shall refer more in detail to this vault-surfaced lava later on.

On arriving at the banks of the lake-like estuary of the Olfusa, we reach a large low-lying alluvial plain extending to Haukadalr on the north and Hekla and the Eyafjalla Jökull to the east. This district, Ran Gar Valla Sysla, is the most fertile and thickly populated district in Iceland, and owes its existence for the greater part to the alluvial detritus brought down from the Lang Jökull and the Hofs Jökull by the Hvitá, and from the Túngnafells Jökull and the whole west side of the Vatna Jökull by the Thjórsá and its tributaries. In this work the Vestri and the Eystri-Rángá and other branches of the Dhverá and the Markarfljót draining Hekla, the Torfa, Eyjafjalla, and Godhalands Jökulls have also played their part.

What more especially strikes one is the remarkable direction that these rivers follow in the highlands. This is particularly the case with the Thjórsá which flows in a remarkably straight line for nearly 100 kil. Their larger branches tend to do the same, except where they join the main stream, to do which they make sharp turns at right angles. With the Túngnaá this is no doubt due to the growing up of Hekla, but, where free from interference, drainage in this part of the island follows a north-east to south-west direction. But more of this presently. When these great rivers reach the alluvial plain, where the main tectonic features are hidden, they meander about, without any definite direction, and form great shallow, lake-like estuaries, with narrow mouths, due to the throwing up of a great sand bar across their mouth by the south-west current.

Travelling in this district is wearying in the extreme, and travellers for days together have to wade interminable rivers, often split up into from six to eighteen hardly fordable streams with dangerous bottoms of quicksand. When, in addition, rain pelts down, the amphibious life has little attraction for any one. It was therefore with pleasure that we reached Holt beneath the triplet of Jökulls. Along this coast are several objects of interest, such as the cascade of the Skogar-foss, one of the drains of the glaciers above, well known from guide-book descriptions. The main drain, however, of the triple Jökulls is the Fúlilækr Jökulsá, which carries off a good deal of the subglacial water from the three Jökulls collected in the triangular depression between them. This Jökulsá is renowned for its stinking water, due to the presence of sulphuretted hydrogen. This is no doubt derived from solfataric action under the ice-cap in the neighbourhood of

the Kötlugjá, a vent lying between and to the east of the Godhalands and Mýrdals Jökulls, and which has been time after time one of the most disastrous centres of volcanic activity during the last nine centuries.

Along this coast are many interesting rocks, especially basalts in sheets, dykes, simply columnar or globular, tuffs, and agglomerates more or less palagonitised in places. The most interesting point, however, is Dyrhólaey or Portland, the southernmost point of Iceland. Natural archways are always beautiful, more especially when on the coast. I have seen many, but I can recall none that was so perfect an arch, or more strikingly situated and interesting than this one. The dimensions are usually given by authors as sufficient to allow a *ship* to pass under it. But *ship* is a most indefinite standard of size, and I doubt if more than a small yawl could get safely through, though I should hardly care to try the experiment with the sea that was running the day we were there. The main mass of the rock, with the adjoining archway, represents the remainder of a submarine basalt cone, like a wedge-shaped slice out of a cake. The picturesque reefs that stand out to sea are the old basalt stocks, representing one or more chimneys of the cone. Towards the land the sides of the cone are exposed in section, with the tuff deposits which exhibit current sorting and false bedding to perfection, indicating the subaqeous nature of the deposit, and the complex currents set up by the eruptive action.

Against the south-west cliff is an enormous talus of sand, with its apex in the most concave part, and reaching nearly to the top. This is a remarkable specimen of a sand-dune, arrested by a wall of rock and moulded by the influence of the air-currents that are directed into the greatest concavity of the escarpment normal to the prevailing or south-west wind, so that the sand is compelled to occupy the bottom of this concavity.

Another point that struck me was the pebbly beach. Pebbles of flint and other fairly homogeneous materials should theoretically be spherical, but for several reasons rarely attain perfection, being usually slightly flattened ellipsoids or ovoids. Basalt pebbles are usually of this form, but those on the broad and magnificent beach of Dyrhólaey are not of those shapes. Here range after range of sorted pebbles of different sizes occur, but all remarkably flattened and disc-like in form. I could find no satisfactory explanation of this resemblance in shape to pebbles derived from foliated or finely stratified rocks, and it is a question whether a peculiar conformation of the coast, certain peculiarly shaped waves, or special currents may explain this phenomenon.

On quitting Dyrhólaey, on the little plain to the north of the shores of the small salt lake, two of our horses were nearly lost by sinking into a dry quicksand. Quicksands are one of the greatest dangers to travelling in Iceland, and the ponies seem to have acquired great caution by heredity, natural selection, or constant practice, so that, if left to themselves, they stop when a river bottom is in the slightest degree dangerous. Our head-guide, Zoega, declared that quicksands could be detected by the presence of white grains amongst the black ones, and those he showed me were sands composed of ordinary basaltic *débris*, with a small admixture of rounded grains of pumice. I collected several specimens, but

unfortunately they were mislaid, and I could not make a careful study of them, as had been my intention. Most of the quicksands we experienced in Iceland were wet, or even covered with water, but this one near Dyrhólaey was quite dry. I do not remember to have seen dry quicksands recorded, nor do I quite see how such great mobility can exist unless the grains be quite spherical, smooth, and very light, but very incompressible.

Our next stay after our visit to Dyrhólaey was at Höfdhabrekka farm, a place interesting from many points of view. In the first place, it is the last habitation before entering on that vast and weird desert of the Mýrdalssandr, some 40 km. of which we had to cross at one stretch to reach Asar. This vast alluvial flat is in great part due to the eruptions of the Kötlugjá, which, taking place amidst the great snow deposits of the Godhalands and Myrdals Jökulls, melted enormous quantities of the snow, with most devastating effects. As we wend our way across this desert we see the great mass of subangular boulders of all kinds of rocks mixed with gravel and sand that were brought down by these great rushes of water. Deep-cut ravines and dry torrents mark the last stage in the great inundation. The heaviest rains since then have done little to disturb the old surface, and the only change is that many of the boulders have been split, and crumbled to fragments by the action of frost. The tremendous violence of the inundation is shown by the large boulders, dozens of kilomètres away from the foot of the Jökulls, which have been transported, for the most part, over a surface of very small inclination. Guide-books to Iceland usually describe these disasters, and record how this once fertile and populous region has been again and again overwhelmed, until only a few eminences, such as that on which the farm of Höfdhabrekka stands and the hill of Hjörleifshöfdhi remain. In fact these great sand and boulder deserts stretch along the coast, for some hundreds of kilomètres, as far as Holtar, encircling the southern base of the great Vatna Jökull, and are, no doubt, at any rate in part, the result of similar violent deluges of ice, water, rocks, and volcanic ejecta, which have swept down when eruptions have taken place in the ice-fields above.

Very little of these great *sandrs* supports vegetation, for they are too frequently renewed by fresh outbursts of eruptive activity in the snow-fields to which they owe their origin. No doubt, were no further eruptions to take place, they would eventually become as fertile and thickly populated as the Ran Gar Valla Sýsla district, which not improbably owes its alluvial origin to eruptions in the Lang, Hofs, Vatna (W. side), Godhalands, and Eyjafjalla Jökulls. In fact that part of the great *sandrs* least exposed to disturbances, between the Kúdhafljót and the Skaptaros, already yield some return to human industry at Thykkribœr, Langholt, etc. The similarity between these two great detritus plateaus is the peculiar shallow, lake-like character of the estuaries, with their exit almost closed by sand bars.

To return to Höfdhabrekka, which is a typical Icelandic farm, owing to its isolation and distance from trading stations, and so afforded us some interesting observations, my description of which I shall supplement from other localities we visited. To tell most people that the Stone Age still persists in Europe up to the dawn of the age of aluminium would

expose one to ridicule; yet such is the case, and it is another proof that such epochs of human civilisation as are denoted as stone, bronze, or iron ages are but relatively correct. In Iceland stone is used for many purposes, and most frequently for hammers. At most coast farms a large stone hammer, with roughly spherical head as big as a human skull, is used on a sort of concave stone anvil or mortar for breaking and pounding up the dried heads of cod-fish, with which the horses and cattle are partly fed during the winter. Hammers and sledges of different sizes and shapes are in frequent use. I saw one man who did tinker's work beating out his tinned plate with a well-made stone hammer, which I bought of him. It was well worn, and answered the particular purpose quite well, although the association of stone hammers and tinned plate manufactured at Neath seems rather incongruous in Europe. Most of these hammers are made from suitable pebbles of basalt, of which a great variety can be chosen from the beaches. A hole is chipped about two-thirds through the centre and widening inwards; at the bottom of this is placed a wooden wedge, and a stick, ready split at the end and just the size of outer opening of the cavity, is driven down on to the wedge, spreading it out so as to hold the head of the hammer quite securely. At the farm above mentioned we found the bob weights on a steelyard balance likewise made of stone, but still more curious was the wheel of a wheel-barrow chipped out of solid stone. Of course in England we have stone rollers for fields and gardens. At the neighbouring Skáptárdalr farm, where we also stayed, we found in the garden a basin formed out of a section of a large basalt column. Advantage had been taken of the cup-like concavity and convexity of the transverse joints of a basalt column, and a thin-sectioned one had been chosen. The concavity had been enlarged and the edges well rounded off, but the old pentagonal outline was still quite visible. The weight of it was very great, and it was no longer in use, being replaced by blocked tin utensils; but the farmer told us it was in constant use when he was a boy. All the fishing-nets at Höfdhabrekka were weighted by sections cut from the tubular shafts of mutton bones. The astragalus or knuckle bone, with a hole drilled in it, was in use for winding yarn upon, and the pointed splint bones, likewise drilled, were strung together ready for pegging out seal and other skins on the ground to dry. Stirrups, spoons, pulleys, hooks for harness, and many other articles were fashioned out of horn, some of them being beautifully and artistically carved. Speaking of carving brings to my mind a box I bought made without nails, but with wooden pegs and wooden hasp, from painted deal boards thrown up from wreckage. The low-relief carving, in most typical Runic style, had been so done as to utilise the painted surface for the scrolls in relief, while the sunk parts were, of course, in the bare wood.

It is not that the Icelanders are conservative, but the absence of roads and bridges, and the distance of trading stations, compel them to use the materials at hand, especially for fragile and heavy articles, so that one can understand their using heavy sledges of stone or segments of basalt columns instead of carrying a fragile crockery basin or a heavy iron sledge three or four hundred kilomètres on pony-back across some

of the most dangerous and diabolical country to be traversed in any part of the world. Stamped tin ware, cheap, light, and unbreakable, has, however, put an end to dining out of basalt columns.

Near the Skálm, towards Asar, we began to exchange the Mýrdalssandr desert for one of lava, and near the track some interesting examples of an underground stream again coming to daylight could be examined. Such phenomena are of very frequent occurrence in Iceland, where lava streams have blocked up valleys, and the water has eventually found its way underneath.

As we wandered over lava or boulder deserts, without a trace of other vegetation than the lava lichens, and often with little of this, we were struck by cylindrical or slightly conical columns of earth covered by luxuriant turf, and often by flowers. Such pillars are usually situated on some elevated position commanding an extensive view, where they are most exposed, and least likely to collect earth. Frequently we saw a bird perched on the summit eyeing the surrounding country. These pillars owe their material, with their great fertility, as well as some of their vegetation, to the droppings of the birds, who use such spots as observatories. They, no doubt, form important centres for the spread of vegetation over lava fields or on boulder plains.

As we approached the Skáptárdalr we had to cross the great Skaptár lava stream, where it occupies the bed of the river. Though at this point very narrow, no less than sixteen different streams had to be traversed, which together represented the single stream that once occupied the valley of the Eldvatn. The valley has been filled up to some considerable depth by the lava that poured down through it, and, spreading out, covered an area 20 km. long by 24 km. broad. So nearly level did the lava fill the valley of the Eldvatn, that only the slight irregularities in the surface of even the most fluid lava have been mapped out by the river that now again flows over it, constantly dividing into a number of streams and reuniting again, so that what would otherwise be a dangerous and impassable river is just fordable in some places. Even as it is, rough, jagged surfaces of scoria at the bottom of a ford make crossing no easy matter. The effect on a sunny day of the silvery glistening streams in black rugged beds is most striking.

The great Skaptár eruption, as is well known, produced the greatest outflow of lava known to have occurred in historic times. Two streams were poured out—the larger one, about 78 km. long and with a maximum breadth of 24 km., issued by a long fissure running south-west to north-east, but curving somewhat towards the south-east, like the area extending from the Skjaldbreidh to Cape Reykjanes I have already described. Along this line lie a great number of crater-cones, some of which rival in size and variety of shape the splendid examples on the slopes of Etna.

Near the northern end of this great fissure another extended nearly at right angles in a south-easterly direction, and gave vent to a lava-stream estimated at 32 km. in length and 8·5 km. in maximum breadth. It was our object to examine, as far as time, weather, and means of access would allow, the features of this great lava flood, which in 1783 continued to issue forth during some months, and caused tremendous

No. 3.

No. 4.

destruction of human life, domestic animals, and pasturage. I refer the reader to the books of the history of Iceland, in which all the details are given.

On quitting Skáptárdalr farm we had to depend entirely on our own resources. We followed the east bank of the Eldvatn, and were able to examine an interesting tuff cone, which, as well as we could make out from its position, must be the Leidhólfsfell on Gunnlaugsson's map. This seems to have been a tuff cone subsequently truncated around an axis excentric with regard to its original plan, while the formation of a second cone on the lowest part of the crater edge has produced a certain similarity with the Somma-Vesuvius volcano.

We finally pitched our camp on the Skaptár lava field, between the Hellisá and the Varmárdalr, the farthest point where we could find any pasturage for the ponies.

The view from our camp was interesting in many ways, for, notwithstanding the levelling effect of the lava floods, the position commanded a very considerable area. The extent of country covered by the great outpour of lava is enormous, for its limits are well marked out by the highlands on each side. These too are interesting, for their summits are frequently very pointed or of a regular conical form terminating in a rather flat top. The cause of this I shall refer to later on. Unfortunately, Icelandic ponies will not eat corn or other easily transportable fodder, and consequently our journey up the Varmárdalr was limited to the distance we could traverse, there and back, in one day. Starting at about 2 A.M., in bright sunlight, we pushed on until we came to the nearest cones, most of which we examined, photographing many. When we had reached as far as we dared to take our horses, considering the horrible nature of the ground, we advanced some distance on foot, and finally, promising my companions that I would be back in three hours, I ran on some miles examining the line of rift and photographing the features of most interest. It was impossible to reach the bifurcation of the two great Skaptár lava-streams, but many varieties of cones, craters, and lava-flows, etc., of this great and unique eruptive display, which occurred in historic times, were recorded in notes or photographs (Photos. Nos. 3 and 4—Panorama). The photos give a very fair idea of the great lava-fields high up the stream and but a few kilomètres from the bifurcation. The panorama is taken from the side of one of the eruptive cones, and another, fairly regular, is seen in the distant foreground, with a row of somewhat similar vents rising behind it. Their chain-like arrangement is remarkable, and very similar to that on a radial dyke of a volcanic cone. The only difference in the Skaptár cones is that they extend to a much greater length and over a country but slightly inclined, and hence are evidently arranged along a great dyke which, however, has nothing to do with any great cone as a centre, unless it may be regarded as being a radial rift in some volcano composing the western end of the Vatna Jökull. The linear arrangement is admirably shown in Photo. No. 5, which also exhibits the variable size and shape of the cones. The twin pair in the foreground are very steep, both within and without, and one contains a small tarn in the bottom. These were

formed by the ejection of great lava-cakes which adhered together and so allowed the building up of steep-sided cones. In the distance, however, is well seen another type, built of more fragmentary scoriaceous material, so that the soldering together was less complete, and the cone has gentler slopes both within and without. The cone in Photo.s 3 and 4 is of this type. The distance between one cone and another varies much, sometimes two or more occurring almost superposed on each other as in Photo. 5, or a distance of several hundred mètres or more may intervene. Strangely enough we usually find cracks and small rifts marking the line of junction between two cones, and at one point a whole chain of remarkably perfect little cones only a few mètres apart form the connecting links between two large ones. This arrangement I have never met with elsewhere in anything like the same regularity and beauty (Photo. No. 6).

The appearance is very well shown in the photograph I took from the lower of the two cones. The dimensions of the Skaptár cones vary very much, ranging from one or two mètres in diameter up to several hundred mètres, the latter rivalling some of the finest parasitic cones of Etna. Many of them are breached, and some in a remarkable manner, a large part of one side being carried forward just as at the bursting of an earth-dam.

One fine example is, singularly enough, also breached on the upper side, a phenomenon unknown in parasitic cones that stand on steep slopes. The fact that the bases of the Skaptár cones are nearly horizontal explains their greater tendency to crack in large breaches and allow lava to escape which can rise to some height within the crater, whereas in parasitic cones it finds an outlet beneath the lower crater wall.

On the lava-fields little vegetation has yet taken hold: the lichens are still thin and isolated, but on the slopes of some of the more scoriaceous cones thick patches of moss and lichen flourish.

In many accounts of this eruption it is said that the lava was five to six hundred feet thick. I saw no evidence of such a thickness, but I must likewise say that I saw nothing to contradict the statement. If really such a depth was attained, it must have been very local. At any rate many of these eruptive cones must have had a greater height than at present apparent, for as they grew their bases must have been buried in the lava flowing around them, though it seems impossible to believe that their original height was 200 m. greater than their present height.

The Skaptár outflow we must look upon as the most perfect type of a fissure eruption of which we have any record, and although the floods of lava were enormous, yet a fair amount of explosive action undoubtedly occurred to have built up so many dozens of cinder cones, a large proportion of which are of very considerable dimensions.

I quitted this district, satisfied on the one hand with what I had seen, but regretting on the other that the highest or most northern point of this great lava fissure had not been reached. When any future attempt is made I feel sure that the base should be at Bratland or Seljaland, as lying much nearer to the goal.

On our return we endeavoured to ford the Eldvatn near a locality

marked Hrafnar on the map, but one of our guides who tried the river just escaped drowning, and we were compelled to follow the stream and recross lower down at Buland.

Our plan was to make our return journey behind the triple Yökulls by the Fjallabaksvegr-nyrdhri or mountain backway. This track, where track exists, is ninety miles in length, and has to be travelled over in two days, as there is only one oasis of pasturage half-way across, sufficient to support the ponies for one night. This fact, of which we were previously unaware, prevented us making an attempt to ascend the Godhalands Jökull and examine the renowned Kötlugjá, the eruptions from which have on several occasions been so disastrous to life and property. Dr. Tempest Anderson had come fully prepared with ropes, axes, and other mountain gear, and we were deeply disappointed. This mountain backway is one of the most desolate places it is possible to imagine; one wanders over kilomètres upon kilomètres of black basalt lapilli, sand, and lava streams, with rarely a patch of marsh or sign of vegetation of any kind; here and there skeletons of horses that have died on the journey in snowstorms, combined with the stories of our guides as to the finding of their masters' bodies, made us feel still more the difficulties of the journey. Road there is none, and only one who has already followed the track could find his way. Add to this a cold cutting wind, blowing off the great ice-fields that hemmed us in on both sides, and constant storms of drifting sleet that might give place to snow at any moment, an occasional fall of a pack-horse through the arch of a snow-bridge, and other misfortunes, were not calculated to promote the equanimity favourable to scientific observation, and made photography a drudgery.

Much of the district, as I have said, is a desert of black basalt lapilli, and the Mœlifellssandr is in large part composed of these. They are probably derived from the Kötlugjá, and perhaps also from Hekla, between which the desert lies. The scenery is grand and weird in the extreme. Combined in one landscape are collected black, bare, rugged and pointed mountains, with patches of permanent snow scattered in the hollows on their flanks; the distant ice-fields of the triple Jökulls, blending at some places with the many-tinted clouds above, at others, spots glistening in the distant sunlight; torrential streams coursing along the valleys in the full swing of their work of erosion, here aided by the most favourable proportions of frost and water, and the practical absence of vegetation. In fact, wherever we look there is striking evidence of the fight between volcanic productivity and destructive erosion. These great Jökulls, when seen from behind, are remarkable for their extremely flat, dome-shaped form, and well deserve the name of ice-caps. During the whole of our journey along the mountain backway we saw no true glaciers. The ice-cap comes right down to the plain, seems to sink some distance into the sand and there to thaw, probably owing to warmth from below. No streams flow away from the edge of the ice, as all the water trickles down through the porous lapilli and no doubt finds its way into the rivers some distance off.

If we examine such a river as the Markarfljót, we are struck by its

volume in proportion to the short distance it flows, and the few surface tributaries it receives. It no doubt is to a very large extent fed by innumerable subterranean tributaries of glacial and other waters. This fact will also no doubt explain its very rapid increase of volume as it passes the Jökulls, and the extraordinary broken condition of its course near Eyvmdarmúli, each channel being fed by springs gushing up from the bottom.

I have on several occasions mentioned the peculiar pointed-conical or truncated-conical form of the mountains. These are, of course, frequently volcanic cones, yet they do not owe their peculiar shape to eruption. Their sides slope too steeply, and their truncated summits are not always occupied by craters. The following explanation, I think, will show how some at least have been modelled. During a good part of the year every mountain-top in Iceland is effectually protected by a snow or ice-cap, which never thaws, except at lower altitudes. The sides of the mountain, however, are exposed to frequent alternations of frost and thaw, and are constantly scaled away by this action, so that, as we approach one of these mountains it looks at a certain distance like a tremendous pile of material for macadamising roads, and on a nearer approach the resemblance is more striking, except that the fragments are frequently as big as coco-nuts or still larger. The angle of repose of these materials is very large, and the fragments around the base are carried away by erosion, so that these mountains in a short time acquire very steep flanks. Gradually this process is continued, until the ice-cap is mined away and falls piece by piece, disappearing at last altogether, and then the summit becomes acute. In fact, the process is very analogous to the formation of earth columns, only the ice-cap replaces the boulder or the stratum of rain-resisting rock. The water from the ice-cap aids also in keeping the surface moist, the condition most favourable for action of frost and thaw. Many of the great Jökulls show these peculiar steep, cliff-like flanks, which are no doubt due to the same phenomena. Of course, I do not exclude the effect of old marine erosion, but I think that where such once existed it has been rapidly effaced by the active processes of frost and rain. A striking example of this is the Laufafell at the east foot of Hekla, close to which we passed after quitting our half-way camp.

Running beneath the Laufafell is the valley of the Markarfljót, the sides of which are terraced for great distances in a most perfect manner (Photo. No. 7). Two long terraces are noticeable, with one or two subsidiary ones. The whole valley seems once to have been a vast lake, produced by its damming up at some lower point towards its mouth. How this was accomplished it was impossible for us to see, and it would require a careful survey to settle the point. Where, however, the Markarfljót doubles back on itself around the Grœnafjall, it is closely hemmed in between this mountain and the Merkr Jökull, a part of the Godhalands Jökull, and possibly it was temporarily dammed by a great avalanche of water, ice, and boulder detritus during the eruptions of the Kötlugjá, or some other rent in the triplet of Jökulls. This collection of detritus may now be represented by the Mœlifellssandr.

All along the road to the south of Hekla this remarkable terracing of

No. 6.

No. 7.

the valleys is noticeable, and I believe that in many cases those are not ordinary river terraces, which are usually very irregular and broken, whereas these show that remarkable uniformity of height and persistence for long distances that characterise the old shore-deposits of lakes.

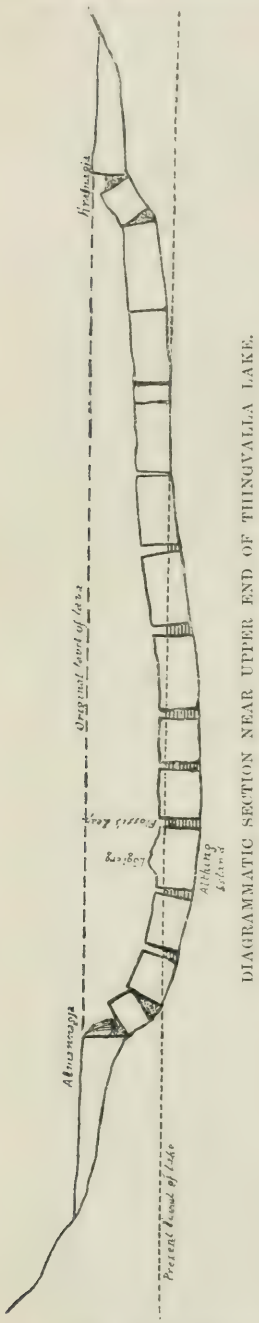
We took up our abode at Galtalœkr farm, intending to make the ascent of Hekla from that point. We waited for three days while it rained in torrents, and, what was worse, the mountain was enveloped in mist almost to its base. We could find no one who had courage enough to guide us in the ascent, and after making a few excursions around its base we had to abandon the idea.

I found many points of similarity between Etna and Hekla as to the products, and more especially the lavas. Yet the quantity of fluid rock that pours forth at intervals from Hekla within a given time seems to be much greater. The surfaces of jagged crusted lava-streams are marked by larger and more prominent humps, and some of the corded surfaces are enormous in dimensions. This is the largest surface of corded lava I have ever seen. Close to Galtalœkr farm the Vestri-Rángá cuts through some of the peculiar dome-surfaced lavas, already referred to (p. 448), and exposes them in section. They are basalt, slightly vesicular, more especially towards the surface, where more vesicular zones can be seen in curves parallel to those of the domes. This lava divides into fairly regular columns which radiate slightly so as to be normal to the surfaces of the domes.

One of the remarkable points about Hekla is its irregular form and its greater length from north-east to south-west, with a somewhat curved plan, the convexity being to the south-east. It is essentially a great ridge of this form, with a great number of parallel ridges and furrows. Most of the parasitic vents upon its slopes are arranged along lines parallel to the general trend of the mountain, and show no indication of the radial arrangement so common in most volcanoes. In these features Hekla totally differs from Vesuvius, Etna, and numbers of other volcanoes. There is, I think, only one explanation, and that is that Hekla is nothing but a volcanic pile built up along a main fissure running north-east to south-west, with probably subsidiary clefts running parallel to the main one. In fact, Hekla may be looked upon as rising over a vent very similar to that of the larger Skaptár fissure, only that freer exit has been found at one particular point instead of along a more extensive stretch of country.

Our journey from Hekla to the geysers presented little of general interest, but rather attractive from geological detail. Most of the mountains and hills are old volcanic rocks entirely remoulded by denuding agencies. Here and there occur hot springs, indicating that, although the rocks look old, igneous activity is still going on not far beneath the surface. Fine radiating columnar basalts were met with side by side with tuffs. Both basalts and tuffs are rich in secondary deposits of zeolitic material, as one would expect in a region of hot springs. From a geographical point of view, perhaps the crossing of the great rivers is of most interest; for the large volume of water rushing down a high gradient, and carrying seawards so much sediment, is striking. In fact,

this high gradient demonstrates the recent upheaval of the country, which is not unlikely actually going on at present.



DIAGRAMMATIC SECTION NEAR UPPER END OF THINGVALLA LAKE.
(Vertical Scale exaggerated. Many longitudinal details omitted.)

Of the geysers little need be said, as we possess so many good and detailed descriptions of them. The Great Geyser seems, from what we were told, to be in a state of gradual decline, and during a stay of a day and night did not afford us the opportunity of seeing a display. The Strokkr, on the contrary, responded to the usual emetic of grass tufts, and went off in grand style. The sinter basin of the Grand Geyser is of a dirty, earthy-brown colour, and quite different from the sinter of Cape Reykjanes. This I attribute to the dirty state of the water, due to visitors throwing in earth and turf in the hope of starting the Great Geyser in the same way as is done with the Strokkr.

No point in Iceland is of more interest historically than the district of Thingvellir, and I doubt if any other can surpass it from the point of view of geography and vulcanology. At no distant date, though anterior to the colonisation of Iceland, a vast quantity of lava was poured out in the broad Thingvellir valley. Whether this took place from the Skjaldbreidh, or from a prolongation to the south-west of the fissure upon which that volcano lies, is not easy to determine. At any rate great floods of lava that rivalled in quantity the Skaptár outpour filled the Thingvellir valley. Whether this depression was then an empty valley, or was already a lake of water, is a subject for further investigation; if such a lake did not then exist, we must suppose that a dam was formed simultaneously with the eruption. This may have taken place by the upheaval of a cone at the lower end of the valley, perhaps one of a series of which the cone of Sandey, that now forms an island in the lake of Thingvalla, is one. The dam for some time retained the flood of lava, which rose until it filled the enclosed valley to the height of the terrace above the Almannagjá. By that time a crust of at least 32 m. had consolidated on its surface towards its edges, if not all over it. The enormous hydrostatic pressure of this lava lake, with a specific gravity of two and a half times that of water, finally burst the dam, and the fluid rock beneath the crust escaped. The amount of lava must have been enormous, for it probably covered a roughly rectangular area about 8 km. broad by 35 km. long, or 280

No. 8.

No. 9.

square km. The great crust settled down, except where supported by the shallower sides of the valley, just as a rim of ice hangs along the banks of a river if the volume of water diminishes. The line of rupture along each side is now represented by the great Almannagjá on one side of the valley, and the Hrafnagjá on the other. The adjoining diagram will make this clear. As the unsupported part of the crust sank, the pieces near its edges swung round and remained tilted on the side of the old valley bottom. At present a small river, the Oxara, flows over the precipice marking the edge of the undisturbed crust, and then flows along the Almannagjá, being shut in between the above-mentioned precipice and the ridge formed by the tilted edge of the sunken part of the crust. The Oxara after a short distance passes through an opening in this ridge, and finds its way downwards and forwards to the lake. The accompanying photograph shows extremely well this remarkable disposition, and the striking scenery it has produced (Photo. No. 8).

The central part of the lava crust that sank till it rested on the old valley bottom is broken up into a number of longitudinal islands by rifts, due partly to contraction, and partly to the irregularities of the old bottom as indicated in the diagram. These rifts, as we approach the lake of Thingvalla, are filled by water up to the lake's level. It is on one of these islands that the renowned Icelandic parliament or Althing was held for many centuries, the laws being proclaimed and annually recited from a boss of lava of greater height near its northern end, and known as the Lögberg, and which commands a magnificent view over Thingvalla lake and Sandey island. With the exception of a narrow isthmus, the Althing is a complete island surrounded by a deep moat of water occupying rifts or *gjás* in the lava, and ranging from two to five or more mètres across (Photo. No. 9).

It was at the narrowest part that Flossi made his great leap to escape from the pursuit of his adversary, as recorded in one of the most renowned of Icelandic sagas.

The Almanna and the Hrafna *gjás* of Thingvellir therefore differ entirely from the rifts of the Reykjanes peninsula. The Icelandic *gjás* or rifts are no doubt of various kinds, and this view has been confirmed by my friend Dr. Tempest Anderson in the case of those in the northern part of the island, which he has examined more recently (*Brit. Ass. Reports*, 1894).

Unfortunately, Iceland is much neglected by English geologists, notwithstanding its easy accessibility; and although Englishmen hold a high place in the history of vulcanology, they seem to have paid little attention to this interesting land. No spot would probably better repay careful detailed investigation than the old lava lake of Thingvellir and the present water lake of Thingvalla. After our return to Reykjavik, having a couple of days at our disposal, we made an excursion to Hengill, with the intention of seeing something of the lower end of the lake. Weather was against us and frustrated our plans, obliging us to return from Hengill without being able to see anything there, as we had to contend with an impenetrable mist and torrents of rain. The journey from Reykjavik is, however, interesting, as about half-way a patch of very

recent-looking scoria cones occurs, worthy of note as not showing any marked linear arrangement.

Where the road passes near the Olafsskardh and Vifilsfell, the lava exhibits some small and striking spiracles in the forms of small cones and craters. The syrupy nature of the lava is shown by the way that the blobs or splashes which fell and built up the crater ring have guttered down into stalactites and drops, as admirably shown in the accompanying photograph (Photo. No. 10).

This is the most perfect example that I have ever seen or heard of of this type of spiracle. I doubt in this case whether they owe their origin to any volcanic vent directly underneath. I take them rather to be due to the local action set up by the lava flowing over a marsh, notwithstanding that similar cones, though less perfect, are often produced by the escape of vapour derived from a body of lava collected in some deep hollow. In other cases such spiracles, though usually in the form of spires, are produced on the roof of a lava-tunnel by the escape of vapour with a little fluid rock from the stream beneath.

I will terminate this somewhat disjointed record of facts by a few speculations that I have indulged in.

Iceland, if not absolutely the largest, is one of the most extensive areas of the earth's surface presenting an entirely volcanic mask of rock. We should expect therefore to find some characteristics not to be met with in such limited areas of volcanic country as are scattered over different parts of Europe, and more especially in a chain of patches extending throughout Italy. Where we have to deal with the oldest Icelandic volcanic deposits, the surface configuration has been so altered by old marine denudation, combined with that produced by glaciers, and subsequently further accentuated by subaërial erosion, that nothing very definite can be made out. The only fact clearly apparent is that during the Glacial Period ice forced its way down to lower levels by the most expeditious route possible. Many geologists would maintain that water would do the same; but the effects of the two are very different. Permeability influences pluvial erosion to an enormous extent, whereas cohesion of rock masses has most influence on the action of glaciers. An incoherent scoria cone is practically indestructible by rain, until its surface is rendered impermeable by decomposition, or by a mantle of volcanic dust from some neighbouring vent, and can serve as a water collector. Such a cone occurring in the path of a glacier would be immediately and entirely cleared away by the advancing ice without leaving a trace of its existence. Enormous scoria cones on Etna have remained practically unaltered for nearly 3000 years, and perhaps much longer; but, were Etna to be so situated as to collect an ice-cap and form glaciers, these cones would not last a dozen years. It is obviously, therefore, almost impossible to form any theories concerning the surface configuration of Iceland, which was to a large extent built up like other volcanic regions of incoherent fragmentary ejecta before the Glacial Period. Some traces may no doubt exist, for we must suppose that a long valley cut out of soft tuffs and filled by a deep and dense lava stream would, after exposure to intense glacial action, appear as a great lava ridge overhanging and

flanked by parallel valleys scooped out of the soft tuffs that had once held the lava flood. Ridge and valley will have changed their relations to each other, and the only trace, therefore, of pre-glacial configuration will be the trend of the country. But even such deductions as these, which may be applicable to subaërial denudation by agents of moderate force, are less reliable when ice is under consideration, for, if the highlands are so situated that the glacial flow is normal to such pre-glacial lava-filled valleys, it is evident that the resulting glacier valley will not correspond with them. Much caution is necessary when we attempt to examine the general features of Icelandic geography, and we are safer, therefore, in limiting ourself in the main to the more recent centres of volcanic activity. It is still more necessary to be cautious when we are treating of an area of which practically nothing is known in detail, and where large tracts of the interior are almost *terra incognita* to the scientific geographer and geologist.

Thus, for instance, we cannot generalise at all on such areas as that between Mosfell and Hvannevri, the great north-western peninsula, or the east coast. Again, the great ice-field of the Vatna Jökull totally hides what is beneath it.

We may conventionally divide Iceland into a northern and southern portion by the line of watersheds. This line is nearly straight, and may be considered to extend from Hof on the east coast along the back part of the Vatna Jökull to Snæfells Jökull. Now what is most strikingly evident is that in the southern half of Iceland we have almost innumerable examples of a trend of the principal features from north-east to south-west. The axis of these ridges and furrows is not straight but is curved, with the convexity to the south-east, so that towards the south the trend becomes more westerly, and to the north more northerly, falling in with the north and south trend of the features of the northern half of the island.

We have already seen that a similar direction is followed by the *gjás* or rifts and the line of recent vents and solfataras of the Reykjanes and Skjaldbreidh tract. Not improbably the Láng Jökull covers the continuation of this line of vents to the north. To this same band probably belong the lavas around Eriks Jökull and at Oldur. Another band seems to include the Merkrhraun, near Olafsvellir, and the Hofs Jökull, and the lavas and hot springs south-west and north of it. Ridge-backed Hekla forms another band with the Hágaunguhraun and the western part of the O'dádhahraun Myvatn, and the lavas and hot springs along the valley of the Laxa at Múli an Nes and the *gjás* near the Vikingavatn. Next, we have a band starting in the Westmanna islands, including the Kötlugjá, the great Skaptár fissure with its main rift curved but running in the prevailing direction, the eruptive centre that some years ago showed itself in the great Vatna Jökull, the great centre of Askja, and the lavas and rifts of the Skinnstakkahraun, the neighbourhood of Gardhr and Presthólar.

The next band may possibly include the lava of Kálfafell, part of the Vatna elevation, and the string of vents of the Kverkhnukarani. Finally, the Svidhinhornahraun not improbably corresponds to vents hidden beneath the eastern end of the Vatna Jökull.

The only exception to this rule seems to be the vents of the Snæfells peninsula. Not improbably they are points along several other bands that stretch away to the south-west beneath the waters of the Faxa Fjördhr.

When we pass to the hydrography of the island, we again perceive the same trend to the south-west. The distribution of drainage will not only be dependent on the sites of more recent eruptive centres but to a large extent on the earlier structural characteristics of a country. Mention has already been made of the courses of the great rivers, the Hvitá, the Thjórsá, the Markarfljót, the Skaptár streams and their tributaries, and to these may be added the two great rivers or Jökulsás of the north-east which flow into the Héradhsflói, running quite independent of, but parallel to, the east coast. Notice, again, the extraordinary chain of the Fiskivötn which drain into the Túngnaá, and owe their existence simply to the impediment of Hekla thrown up across the line of drainage of which probably the Ytri Rángá and the Eystri Rángá are remnants. I have referred slightly to the influence of old lava streams in fixing the trend of the country, even in the face of great erosion, so that these peculiar parallelisms between the water-courses and the bands of volcanic vents are quite comprehensible. When we examine the map of Iceland, we are struck by the great numbers of ridges and rows of more ancient volcanoes in a direction from north-east to south-west. I will name only a few of them: Klukkutindar, Kalfstindar, near Midhdalr, the hills to the south-east of Blodhufell, and dozens of such elevations on a line drawn from the latter to Hekla, most of the valleys and ridges in the Skaptár neighbourhood, and, lastly, the country immediately north of the Vatna Jökull.

When we examine the northern watersheds of Iceland, we there see an equally marked trend of country and of recent volcanic vents, but with this difference, that in the main the direction is north and south. The same applies to the great *gjás*. In fact, the farther we advance to the north the more does the curve sweep round, sometimes almost to north-north-west. In describing the form of these curves over the whole of the island we may say, that as we advance towards the north-west the radii of the curves diminish, as if they were segments of circles described around a point situated somewhere near Sæbol or Stadhr in the extreme north-west of the peninsula, and between this and Snæfells Jökull. Even the fjords of the north-west peninsula seem to indicate the same arrangement. Along the peninsulas of the north of Iceland we see a similar extraordinary trend of the chains of hills. In such curves lie the two great Jökulsás of the east country, which run along the main tectonic axes, as indicated by me, of the island, and quite independent of the unimportant fjords along the east coast, although parallel and close to them—a peculiar conformation analogous to that of the Nile and the Red Sea. When we ask ourselves what these curves really represent, we have to consider some of the points concerning the distribution of volcanoes.

If we travel south to Scotland we shall there find, I think, the true explanation. Sir Archibald Geikie and others have shown the remark-

able systematic arrangement of the igneous dykes of Scotland in a series of almost parallel curved lines, and if we compare a map of Scottish dykes with a tectonic curve map of Iceland, the analogy is very striking. It is quite obvious that, if volcanic vents assume a chain-like or serial arrangement over parallel dykes, the drainage of such a country will sooner or later be forced into a similar parallelism, and that, notwithstanding deeply-cut resculpturing by glacier action, the old lines of softer or harder rock will sometimes reassert their influence in directing the line of waterflow, when subsequently exposed to subaërial aqueous denudation.

I think also that, as such tectonic curves are in the first place dependent upon the lines of crumpling of the earth's crust, we ought to be able to find some indication of such plication, for it is not to be supposed that folding of this kind stops simultaneously with the initiation of volcanic action. Possibly the great *gjús* of Iceland, exclusive of course of those of the type of the Thingvellir district, may possibly be surface manifestations of such folding now going on, unless the other suggestion I made be true —that these rifts are simply indications of plication over laccolites.

The peculiar tendency for secondary lines of weakness to run at right angles to the main ones is possibly indicated by the sudden sharp turns of some of the rivers or by the affluents joining the main stream at a large angle. Such examples can be found in the Laxa branch of the Hvitá and the Thjórsá at Búrfell, the branches of the Thjórsá on its north-west bank, and the Túngnaá. Then, again, the Eldvatn and its connections in the Skaptár show this in a remarkable manner. Still, most of these bends may be simply accidental and due to obstruction occurring in their line of flow. The frequent occurrence of subsidiary faults at right angles to the main ones is a fact of common geological knowledge. Dykes also not infrequently run at right angles to each other and may be of contemporaneous origin or not. At any rate, these are considerations to be borne in mind in studying such an extensive tract of volcanic country as Iceland.

Reference has been made to the denuding agencies of ice, frost, and water, but there is yet another of no mean importance, especially from the point of view of agriculture, and that is wind. Only those who have experienced it can form an idea of what wind is in Iceland. Not that it is of the nature of tornadoes or cyclones, which are immediately destructive, but it is rather remarkable for its steady persistence in one direction for days together. The wind may make or mar a farm in a few years, and, as such changes are common over the whole of that part of the island we visited, it is a subject worthy of some consideration. I have seen somewhat similar effects produced on a smaller scale in other recent volcanic districts. The effects of wind are agriculturally of far more importance in a country in which lavas predominate, as in Iceland, than in a tuff country where any amount of wind would fail to denude the surface of material fine enough to form vegetable soil.

If we examine such a district as Roccamonfina or that of Naples, we see how the showers of volcanic materials that have fallen on bare sterile limestone hills in the neighbourhood have converted them into fertile

slopes which have remained such for many centuries, except where man by tree-cutting has allowed rain to undo the fertilising effects of former volcanic outbursts. The same remark applies to the rugged inhospitable surfaces of lava streams which require many centuries to become sufficiently decomposed to support other vegetation than lichens. On Vesuvius luxuriant pine forests, vineyards, and gardens cover portions of very recent lava streams that have been favoured by a mantle of fine lapilli, dust, or alluvium, whereas other portions of the same or much older streams not so covered are as barren as the year they were emitted. Large tracts of Iceland that have received such a mantle of fine volcanic dust and lapilli now support luxuriant pasturage. In some cases this earth-covering has been deposited direct from the air at the time of the eruption or eruptions that ejected the material constituting it. In most cases, however, it is the result of several eruptions, as shown by its fine stratification, which persists over wide areas. Thus, I could recognise a peculiar white band of minute pumice over some hundreds of kilomètres of the country we traversed. This band increased in thickness and in the size of its components as we advanced by one road, and diminished as we retreated by another. Had we had time we could have traced this pumice up to its origin, as I have in several cases been able to do in other volcanic regions. The strata constituting the agricultural soil of South Iceland are composed of materials varying in size of grain, in colour, and cohesion, so that when seen in section they exhibit a band-like arrangement. Some soils are clearly composed of secondary or similar materials transported from other districts and redeposited, and these of course show the usual dune-like false bedding. As long as the turf over a field is intact the winds add to the quantity of productive soil, for the dust and sand that falls, provided it is not sufficient to bury the grass and so kill it, is caught and retained between the blades and increases the depth of the soil.

If, however, but a small hole is made in the turf, woe betide the field and perhaps the farm. The frost scales up a layer of earth which on drying crumbles and is carried away by the wind and falls into some river or the sea, or goes to enrich the soil of the farm to the leeward. The hole increases in size and depth like a corroding ulcer; the larger it gets the more rapidly does it extend, and soon the surface of the subjacent rock is laid bare. In the next stage what was once a fertile meadow is reduced to a bare rock surface, with a few islands of turf overhanging crumbling heaps of vegetable soil, and in a year or two all has disappeared. These peculiar eroded, ulcer-like patches of wind-denuded agricultural soil are quite a feature in the scenery, with the peculiar meandering outlines of the boundary between bare rock and turf marked out by the parti-coloured strata-banding of the soil mantle. The careful Icelandic farmer is aware of these facts, and stops any hole in his turf as soon as possible, unless the field be well sheltered from the wind. It was often interesting to hear our guide's expression of disgust when he saw a farm being gradually blown away in consequence of the negligence of the owner.

I have described the destruction of turf-covered soil—a most obvious

No. 10.

No. 11.

process; but it may be asked, if the wind will do this, how is it that it has ever allowed any dust or soil to remain long enough to become covered with vegetation? This was a great puzzle to me at first, but I think what I saw will explain away the difficulty, in part if not entirely. The process is a long one, and commences by the growth of the extraordinary crops of lichens so luxuriant in Iceland. These act as dust traps and pave the way for the growth of mosses, which eventually give sufficient hold for grass, ground willow, or birch bush. Then the soil increases in thickness by further additions brought by the wind or falling from the air during some distant eruption.

Of course in sheltered localities grass grows easily and wind erosion has no destructive effect, but, on the other hand, in wind-swept regions vegetation seems powerless either to obtain or retain a hold. Thus the Reykjanes peninsula is remarkably bare, covered with sand dunes, and exposed to the most dreadful dust storms. One of these we experienced, and it quite equalled anything in the Sahara so far as the mechanical effect went. I photographed the storm, but the negatives are all sand and cloud-like, just as some battle pictures are all smoke. All around Cape Reykjanes the rocks are eroded and polished by these natural sand-blasts. In the accompanying photograph the flow structure and variations in vesicularity are beautifully etched out by the cutting action of the blown sand on a low basalt cliff (Photo. No. 11). This is the more remarkable because basalts in general, and this rock in particular, show little of such flow-structure on an ordinary fractured surface. In fact, most of the older rock surface of this district is rounded and polished by the sand blast.

Another striking feature is the remarkable humpy nature of the pastures, which often renders travelling over them a dangerous and tedious process. They may best be compared to a churchyard with grave-mounds very closely packed, so that the space between one hump and another is little more than the breadth of the foot. The height of these humps is often that of the knee of a man or horse. The size varies in different localities, but is fairly uniform over any one district. The causes of this humpiness seem to be various. Not unlikely the irregularity commences with the original lichen covering. When grasses spring up amongst this it will be in separate patches. The more prominent tufts will entrap more dust from the wind. If the soil becomes boggy, the grass will grow better on the drained tops of the humps than in the waterlogged trenches, as we see in our own marshes. Then, again, the swarms of birds always perch on the humps, which are rendered more fertile by their droppings. Finally, the snow will always be thawed on the tops of the humps first, and the grass on them will get the start in sprouting at spring-time. Frequent mowing tends to obliterate these humps, as the grass in the hollows is more protected from the scythe and gets light and sun when that of the top of the hump is kept short.

Many writers on Iceland have referred to the special industries of the people, but few of them, as far as I have read, offer suggestions for improving the lot of the Icelander, who is a most deserving man, and whose remarkable literary culture eminently fits him for applying scientific

and technical methods. The three greatest difficulties that the Icelander has to contend with are absence of limestone, forests, and roads. The consequence is that, with the exception of a few constructions of corrugated iron, the farm buildings of Iceland are very primitive, affording cramped, unhealthy, and imperfect shelter to man and beast. Irregular slabs of lava alternating with strips of turf form a very imperfect wall. This is indeed made less pervious by a lining of wood, which, however, must be used most sparingly, whether it has to be carried many miles on ponies or is obtained from teredo-bored drift logs thrown up on the coast. Partly in consequence of defective shelter the death-rate of the people is high, and large numbers of sheep die during the winter. To a large extent two of these difficulties would disappear if good roads were made round the island, especially if cheap narrow-gauge railways were constructed beside them. Large quantities of dairy produce, meat, fresh and salted fish could be brought to the trading ports, and sent to England, France, Germany, etc., in a few days, whilst timber, coal, and lime, besides flour and other commodities, could be obtained by the farmers in exchange.

It has always puzzled me why there are no trees in Iceland. One is told that about once in ten years the ice-pack sets on the north coast and spoils the summer; but surely there must be some trees of subarctic regions, that thrive in far more rigorous and uncertain climates, which could be introduced into Iceland. I saw many sheltered spots where whole forests would find a congenial home, and where the stunted birches and willows indigenous to the island thrive in luxuriance. I could hear of no serious attempts even at acclimatising trees of any kind. There is, then, in one way or another, a large field open for the employment of capital at only a few days' sail from the great Scotch and English markets.

With such means of communication as I have suggested, Iceland offers, especially to the fisherman and devotee of the gun, unrivalled opportunities, while the tourist would have within reach a new field for his summer or autumn holiday, enjoying a summer climate superior to that of Scotland and accessible by a short and pleasant sea trip. The invalid would find relief in the innumerable and varied hot springs of the island.

No doubt, were road communication introduced, handicrafts would gradually spring up, giving occupation to the people during the long winter, and adding to their prosperity.

In any case, Iceland offers to the geographer and geologist a wide field of investigation which, however, must be pursued by them conjointly, as these two branches of science are inseparably interdependent, perhaps even more so in the land of frost and fire than in any other.

THE INTERNATIONAL GEOGRAPHICAL CONGRESS.

The sixth of these meetings was held in London, commencing on Friday, July 26th, and closing on Saturday, August 3rd. The arrangements were carried out by the Royal Geographical Society, the President of the Society, Mr. Clements R. Markham, being President of the Congress, and Mr. Scott Keltie and Dr. Mill acting as Secretaries. The Royal Scottish Geographical Society was represented, as previously announced, by Professor James Geikie and Lieut.-Colonel Bailey. The meetings were held in the Imperial Institute.

On Friday, August 26th, the Congress was formally opened by the Duke of York, Mr. Clements Markham afterwards saying a few words of welcome to the delegates, on whose behalf Chief-Justice Daly, President of the American Geographical Society, replied.

On the following day the assembled geographers entered on their duties, the proceedings being opened by the President.

Among the subjects he touched on was Geographical Education, deploring, as all students of geography must do, that the science received so little encouragement from the Universities of Great Britain. In geographical education, he remarked, France and Germany, and indeed most of the Continental nations, were far in advance of Great Britain, and it was therefore a subject to the discussion of which they (of the Royal Geographical Society) looked forward with more than ordinary interest. They felt very strongly that, so far as Great Britain was concerned, the future of geography depended upon the training of our teachers. Yet, not only was there no recognition of the subject as one which could confer a degree in any of our Universities, but experience showed that there was a determination at present that geography should not be so recognised. The authorities of the Universities of Great Britain were not even aware that geography was a distinct branch of human knowledge, a science in itself. Practically, they denied that it was an independent subject of study, and merely treated it, when it received any attention at all from them, as subsidiary to history or some other recognised subject. The geographers of Great Britain, with the exception of a few who had been educated abroad, were consequently self-taught ; and great efforts would be necessary to save the rising generation from the same disadvantages. They were in want of competent teachers. Geography was the mother of all the sciences, for the astronomy of the ancients was nothing more than mathematical geography. In modern times other sciences had sprung from it, while the mother science had continued to treat of those daughter sciences from the point of view of their geographical aspects. These cognate sciences answered their own questions, but none of them answered any questions in the form in which geography put them. Geography was therefore a distinct branch of knowledge, and he contended that, from an educational point of view, it was the most important. As had been well said by the able Reader at Oxford, geography supplied a store of invaluable information ; it was a stimulating basis from which to set out along a hundred special lines ; it was a discipline, and it was an implement for the calling out of the powers of the intellect. Holding these views respecting the educational aspects of geography, and feeling the importance of a University training for their future teachers, they were confronted by the absence of any such training on an adequate scale, and of any encourage-

ment such as was furnished by the granting of degrees in the Universities of this country. The time had therefore come for the geographers themselves to organise a scheme of education for teachers and others, to supply the training which our Universities were not in a position to furnish. When the country was supplied with well-trained instructors, the standard of teaching would be raised in secondary schools where it existed at all, geography would be introduced into the curricula, where it did not now find a place, and the Government examination papers would be prepared in a very different way from the present, with a view to testing knowledge instead of inflicting useless torture on the memory. The training which would be furnished for teachers would, of course, be available for explorers and other aspirants for geographical fame; and the want so much felt in this country, becoming more serious every year, would be supplied.

Mr. Markham referred also to surveying, and particularly in Africa, and advocated Polar exploration for scientific purposes, quoting with approval Lieut. Weyprecht's opinion that ships should not be sent to the Arctic seas solely to search for the Pole.

The Congress was then divided into sections to discuss (1) Education and (2) Photographic Surveying. In the former Professor E. Levasseur read a paper on Geography in Schools and Universities, dealing chiefly with the work done in French schools and colleges. He was followed by Dr. R. Lehmann, who spoke of the importance of a University training for teachers of Geography, and gave a syllabus of geographical teaching. Mr. Andrew J. Herbertson insisted on the importance of geography and the necessity of properly qualified teachers, bewailing the imperfect training of most teachers in the higher schools of this country, and advocating the formation of a properly equipped geographical department in each of the Universities. He drew attention to the curious anomaly that while the working man must learn geography, the professional man is often very inadequately acquainted with the subject. Lastly, Dr. Henkel, of Dresden, treated of the intimate connection between geography and history, sketching the progress of civilisation from Asia, where the human mind began first to emancipate itself, to the nations of Modern Europe, and citing Great Britain as the country furnishing the most fertile and characteristic material for illustration.

In the other section Colonel Laussedat sketched the history of surveying and cartography from the Greek age to the present day; Captain E. H. Hills, R.E., noticed Dr. Schlichter's method of photographing lunar distances, and the improvements introduced by Dr. Runge; and Professor J. Thoulet suggested that photography might be applied to the delineation of sandbanks uncovered at low water, which are subjected to such rapid changes by wind and sea as to defy the slow method of sounding.

The proceedings on Monday were opened by Dr. Neumayer of Hamburg, who read the first paper at a general meeting for the discussion of Polar Exploration. It was to the Antarctic regions that he invited the attention of his hearers, dwelling on the valuable additions to several branches of science that must accrue from investigations in that almost virgin field. Admiral A. H. Markham took the other Pole for his theme, and discussed the various approaches to the threshold of the unknown

region. General Greely also spoke on the subject. Herr S. A. Andrée then described his scheme for reaching the North Pole in a balloon.

In his opinion the requirements for the success of the undertaking were as follows :—

(1) The balloon should have sufficient lifting power to carry three persons with the necessary instruments, provisions for four months, and ballast, estimated to weigh all together about 3000 kg. (59 cwt.).

(2) The balloon should be of such impermeability as to keep afloat for thirty days.

(3) The filling of the balloon must take place somewhere in the Arctic regions.

(4) The balloon should be steerable to some extent.

That the first condition could be satisfied was proved by the fact that the captive balloon at the Paris Exhibition of 1878 had a carrying power 9000 kg. in excess of that required by the Polar balloon. Since then M. H. Giffard had made several balloons quite suitable for the purpose.

As regards permeability, Herr Andrée, on the base of Messrs. Poiseuilles and Graham's experiments, estimated that a balloon of the size required, 75 feet diameter, would lose no more than a cwt. of carrying power in thirty days. The portable hydrogen apparatus constructed for military service would render it possible to fill the balloon in thirty to forty hours, and a shed for the purpose could easily be erected in some place in the Arctic regions.

To enable the balloon to be steered, its speed might be retarded by the use of one or more guide-ropes, and, a difference of velocity relative to the wind having been thus established, a sail might be used as a rudder. By this means Herr Andrée had caused his balloon, the *Svea*, to deviate on an average 27° from the direction of the wind, and sometimes as much as 40°.

The start was to be made in July 1896, from the Norsköarne or other suitable place, and the balloon would be so balanced that it could sail at an average height of about 800 feet—below the clouds but above the fog. At that time of year the advantages for the voyage were the continual daylight, nearly uniform temperature, with a consequent slight variation in the carrying power of the balloon, and the absence of snow-falls.

M. E. Payart urged that simultaneous expeditions should be sent out into the Arctic regions by international agreement, and Lieut.-Col. Shovalski gave a sketch of Russian researches on a sea route to Siberia.

At the sectional meetings Physical Geography and Geodesy were the subjects of discussion. Prince Roland Bonaparte described the methods employed for the measurement of the movements of glaciers, and mentioned that more than two hundred glaciers in the French Alps were under observation. M. G. Lennier treated of the modification of the coasts of Normandy by the action of marine animals, wind, and weather. MM. J. de Rey-Pailhade, Louis Fabry, and Bouthillier de Beaumont proposed various methods of measuring angles and time. Dr. de Rey-Pailhade would divide the day of twenty-four hours into 100 equal parts called *cés* (abbreviation of *centijour*), with decimal subdivisions called *centicés* and *dimicés* (ten-thousandths of a *cé*), and the whole circle into 100 *cirs* (from *circulus*), divided into *centicirs* and *dimicirs*. Thus the time would exactly correspond to longitude, and the same numbers would represent both. M. Fabry preferred to divide one, rather than four,

right angles into one hundred parts. M. de Beaumont was in favour of the adoption of a universal time, and proposed the meridian of Cape Prince of Wales, the most westerly point of North America, as the primary meridian.

Among the papers on Geodesy was one by General J. T. Walker, describing the geodetic operations of the Indian Survey. Colonel Holdich dwelt on the desirableness of a geodetic connection between the Russian and Indian Surveys. He stated that five-sixths of the enormous arc between the west of England and the east of Burma had been triangulated, four-fifths, probably, geodetically, and recommended measurements of a longitudinal arc, about 400 miles in length, between the Indus and Charban on the Persian coast, a meridional arc, 600 miles in length, from Charban to Meshed, and a longitudinal arc of 400 miles from Meshed to Teheran. Mr. A. de Smidt sketched the rise and progress of cartography in Cape Colony from the year 1652, when Lacaille measured an arc of the meridian, and Dr. David Gill, Cape Astronomer, gave an account of the triangulation of the colony.

The general meeting on Tuesday, July 30th, was engaged in the discussion of the map of the world on the scale 1 : 1,000,000, proposed by Professor Penck, and resolutions connected with recording geographical literature, and a variety of other subjects. As regards the map, there are no doubt many difficulties in the way of its construction, but nevertheless most of the speakers supported the proposal. Professor Wagner alone considered that geographical science was not sufficiently advanced. The French delegates were willing to accept the meridian of Greenwich as the prime meridian. They, however, desired that the metrical system of measurements should be adopted, to which it appeared that the Governments of Great Britain, Russia, and the United States were unwilling to agree.

At one of the sectional meetings Oceanography was the subject of discussion, Mr. J. Y. Buchanan giving a retrospect of the work that has been done during the last twenty years, and the Prince of Monaco contributing a paper with a description of his apparatus and the results of his cruise in 1894, which were noticed on p. 198 of this volume. The cruise of the present year had, at the time of writing, yielded some good results. Captain A. S. Thomson dealt with ocean currents, maintaining that the principal factor in their causation is evaporation.

It had been estimated that in the trade-wind regions a cubic inch of water evaporates in twenty-four hours from every square inch of surface, and Captain Thomson showed that the principal surface-currents in the different oceans circulate round areas where the evaporation is greatest. He held that the angular velocity of the ocean-surface relatively to the solid globe might be increased through the attraction of the moon, but that wind was not a primary cause of currents. The effect of varying barometric pressure required investigation.

Professor W. Libbey made an important contribution on the relations of the Gulf Stream and Labrador Current.

He maintained that though other factors came into play, the winds were the most active causes of the daily and seasonal variations along the surface boundary

of these currents. The winds of the North Atlantic may be divided into the south-easterly and the north-westerly. The former tend in summer to drive the warmer waters at the surface towards the coast, forcing them over the colder waters of the Labrador Current, while the others, blowing in winter, have a contrary action ; and the final position after a cycle is completed depends on the relative velocities of the two sets of winds. The movements may equalise one another, but it is conceivable that there may in a series of years be an excess in one direction and a consequent displacement of the boundary on the surface. As to the lower portion of the currents, it might be expected that they would be affected only by the causes which modify the general circulation of the oceans. But repeated changes, such as those described above, will in time make themselves felt, and the main mass of the current will change its position, though more slowly than the upper portion.

The isotherm of 50° F. indicates clearly the changes that take place. During the investigations in which Dr. Libbey took part, its predominant shape was that of the letter S, while the isotherms of 40° F. and 60° F. showed no great deflections, being apparently well within the main bodies of their respective currents. In 1891, though the general relations of the currents remained unchanged, it was noticed that the curve of the lower part of the 50° line touched the edge of the continental plateau, so that warmer water than usual was found from a depth of 70 fathoms down to 120 fathoms, and a comparison of the profiles of three years showed that during the period a progressive motion towards the shore had been taking place. Consequently, the increase of temperature had in the summer of 1891 reached about 10° F.

This investigation led to the solution of an interesting biological problem. In the years 1880 and 1881 the recently discovered tile-fish (*Lopholatilis chamæleonticeps*) appeared in large numbers in the area under observation, and attracted considerable attention from fishermen, who hoped to take it in the following spring to the New York and Boston markets. But in the spring of 1882 the water from Cape May to Nantucket was covered with millions of this fish in a dead or dying condition, and from that time the tile-fish had never been caught. Now, as it was always caught at a depth of 60 to 130 fathoms in water of a temperature between 50° and 58° F., it seemed probable that if the movement of the 50° isotherm coastwards were continued through the year 1892, the conditions favourable to a visit from this deep-sea tropical fish would again be produced. And this is exactly what occurred. In July 1892 Dr. Libbey went out with the Commissioner of Fisheries to the area south of Martha's Vineyard and caught the fish all the way to the Delaware capes.

At the other sectional meeting the chief subject was the Orthography of Place-Names. Mr. G. G. Chisholm proposed the appointment of an international committee to lay down rules for their spelling, and specified certain points that must be discussed. Dr. Burgess advocated the spelling of place-names in Europe in their original form, condemning even such well-established English forms as Brussels, Leghorn, and Vienna, while for languages written in characters other than the Roman be recommended, for general use, transcription without diacritical marks. He would not modify the transcription in the case of a letter changing its sound according to its position. Dr. Giuseppe Ricchieri also spoke on the difficulties attending the formation of a universal system of orthography, and suggested lines on which an international commission might be formed.

One of the meetings that attracted most attention during the Con-

gress was held on Wednesday, July 31st, the subject of discussion being the 'Development of Africa by White Races.'

Sir John Kirk opened the meeting with a paper in which he dealt with (1) the possibilities of colonisation proper; (2) the establishment of settlements permitting of residence more or less temporary by a limited number of Europeans; and (3) the means whereby the native races may be taught to develop the country themselves. For European colonisation the necessary conditions were, he said, (1) that the climate, as regards diurnal and annual range of temperature and humidity, should approximate to that of countries already colonised by Europeans; (2) that aggravated malaria should be absent; (3) that the country should be capable of supporting Europeans, and offer also other attractions; (4) that these conditions should extend over a considerable area, so that the colony might be large enough for self-defence, etc.; and (5) that rapid means of transit through the unhealthy districts should be provided.

The data regarding climate were insufficient, but maritime zones and districts below 5000 feet might be dismissed as useless for the purpose. The fever in high lands was of a mild type, and the healthy plateaus were fertile, and offered attractions to colonists. Elevated tracts were, however, often rendered unsuitable through being intersected by belts of malarial country or river valleys. Canoe voyages along rivers were dangerous to health, and therefore steamers and railways must be relied on as means of access to the healthy areas. Matabeleland fulfilled all the conditions laid down as requisite for colonisation, and probably the high plateau west of Nyassa and Batokaland was another suitable district. Masailand would be fit for colonisation when a railway was constructed to it. All West Africa must be excluded, except perhaps German South-West Africa, which had probably a good climate and minerals, but lacked harbours.

Mr. A. Silva White, after alluding to the leading factors in the problem, drew the conclusions that tropical Africa is, on the whole, unsuited for European colonisation, and capable of only a limited degree of development as compared with other still undeveloped parts of the world. To attain this restricted development, it was essential that the Powers should put into practice the enactments of the various African congresses, that imported labour should be introduced in default of native labour, and that railways be constructed from the coast to the chief centres of European settlement in the interior. He was of opinion that very few regions were at the present day capable of returning a reasonable interest on capital, unless they contained mineral wealth, and that, therefore, Government assistance was necessary. The opening up of Africa must follow the lines of least resistance, either along great river highways, or good roads and railways. The most favourable conditions for tapping the resources of Inner Africa appeared to find their natural base in South Africa, and hence the development of Tropical Africa would proceed most rapidly from the south along the main continental axis, which would probably be united by subsidiary paths with the east coast. Greater political obstacles would make the advance of Europe from the east slower.

Graf Joachim von Pfeil and Herr Klein Elguth contributed a paper on the general aspects of the question, while M. Lionel Dècle entered into details regarding roads, markets, police, and other regulations. Mr. E. G. Ravenstein, Mr. H. M. Stanley, and others, joined in the discussion, and Slatin Pasha briefly related his experiences during sixteen years spent in the Sudan, eleven of which he passed in captivity.

The meeting was continued in the afternoon, when General E. F. Chapman read a paper on the mapping of Africa, a subject on which he wrote a letter to the President of the Royal Geographical Society in May last (see p. 367 of this volume), and M. Victor de Ternant gave an account of what the French had accomplished towards the development of Africa, and spoke of their colonial policy in the future. It was, he said, the aim of France to create a colonial empire in the north-west as the English had done in the south-east. Mr. Rolland's project for a trans-Saharan railway was also mentioned. It would be more than 1900 miles long, and would cost £12,400,000. Mr. Silva White exhibited his Chrestographic map of Africa, which was first published in the *S. G. M.* in 1891.

The same day a sectional meeting was held to discuss questions in Oceanography and Limnology. Professor Pettersson propounded the scheme, drawn up with the assistance of Herr G. Ekman, which concluded his *Review of Swedish Hydrographic Research* in last year's volume of the *S. G. M.* (p. 631), and Mr. H. N. Dickson read a paper on the circulation of the water on the east coast of Great Britain as ascertained during his expeditions on the *Jackal*. These results were reported in vol. x. p. 467, and vol. xi. p. 136.

Limnology was treated of by Professor F. A. Forel, and Dr. H. R. Mill. The former claimed that limnology was a distinct branch of the science of geography, seeing that a lake was more thoroughly distinct than most other geographical phenomena, and that each lake had its peculiar chemical conditions and inhabitants. He then detailed the various heads under which limnological work may be classified—hydrography, geology, etc.

Dr. Mill confined his remarks to the work accomplished in the British Islands, beginning his sketch with the year 1755, when the waves observed in Loch Lomond and other lakes, during the Lisbon earthquakes, first excited some curiosity in the subject. The following record may be of interest and useful for reference.

Sir Robert Christison carried out in 1872 a series of temperature observations at various depths in Loch Lomond, by means of a cistern thermometer, and Mr. J. Y. Buchanan made an elaborate series of temperature observations in the same lake and in other lakes of Scotland. Some interesting thermometrical results were also obtained by Mr. John Aitken of Darroch, and the work was carried on in Loch Lomond, Loch Katrine, and other lakes, by the Scottish Marine Station, in conjunction with the long series of observations on the sea-lochs of the Clyde area.

Depth, the primary element in limnology, has been officially ascertained and charted by the Hydrographic Department in the lakes of the Caledonian Canal, in Loch Lomond, and Loch Awe. Loch Morar has been sounded, though not completely, by Messrs. Murray and Buchanan, and found to be the deepest (1080 feet) in the British Isles. Loch Tay, Loch Rannoch, and several other lakes in Perthshire were sounded in 1888 by Mr. Grant Wilson of the Geological Survey; Loch Eck and the small Dubh Loch in Argyllshire, in 1889, by the author. The Geological surveyors also made valuable sections across most of the lakes in the north-west of England, with the object of finding evidence for geological theories.

The author's own work in the English lakes need not be referred to at large, as the results have been published in the *Geographical Journal* (see p. 478 of this number of the *S. G. M.*).

Thursday, August 1st, was another great day at the Congress, the subject of the general meeting being Exploration, in which the Antarctic regions occupied a prominent place. Herr C. E. Borchgrevink described his voyage to Victoria Land in the *Antarctic* (see p. 372 of this volume), and advocated the choice of Cape Adair as the centre of operations for a scientific expedition. He expressed himself willing to lead a land party with the object of reaching the South Magnetic Pole, which would be about 160 miles distant. Dr. John Murray approved of the selection of Cape Adair; and on the motion of Professor von der Steinen a resolution was unanimously carried, to the effect that Antarctic exploration is the greatest piece of geographical work still to be undertaken, and that scientific societies throughout the world should do their utmost, in whatever way may seem to them most effective, to bring about the commencement of the work before the end of the century.

Several papers of minor importance were then read. Professor C. M. Kan exposed the present state of exploration in the western half of New Guinea, and claimed that the Dutch, though hampered by various adverse circumstances, had shown greater activity in the work of exploration than they were generally credited with. Mr. David Lindsay urged further exploration in Australia, pointing out the parts yet untraversed. M. Paul Vuillot described the lakes of Tele and Faguibine near Timbuktu (see p. 81 of this volume), and M. E. F. Gautier gave an account of his explorations in the north-west of Madagascar.

At a sectional meeting to discuss questions relating to Cartography, M. Elisée Reclus proposed the construction of a globe on the scale 1 : 100,000, to be set up at one of the great centres—London, New York, or Paris, and to be furnished with fittings to facilitate study and general use. The diameter of such a globe would be more than 400 feet. Signor Cesare Pomba moved a resolution on the construction of globes. M. L. Drapeyron sketched the life and work of Cassini de Thury. Herr W. F. Fritzche described hill-shading by double lighting, and Herr von Haardt gave an account of his ethnographical map of Europe, which is to appear next year.

In the Physical Geography section Professor F. Palacky dealt with the geographical conditions affecting the evolution of plants and animals; Dr. Edmund Naumann sketched the fundamental lines of Anatolia and Central Asia; and Mr. Henry G. Bryant read some notes on the most northern Eskimo.

On Friday, August 2nd, the History of Cartography formed the subject of several papers. Professor Hermann Wagner, who has published much on ancient maps and charts, mentioned certain peculiarities in mediæval Italian charts.

He pointed out that, while the mile used for the Mediterranean was about 4000 feet, or two-thirds of a modern nautical mile, that used for the Atlantic was four-fifths of a nautical mile (4855 feet), or equal to the Roman mile. Hence he inferred

that the former maps were of older date. The shorter sea-mile was still in use among Greek mariners, and must be identical with that used by the ancients. The faulty orientation of the mediæval maps could not be accounted for by magnetic declination alone. Several typical errors were common to Visconte's maps (1318) and to Ptolemy's. As regards projection, separate marine basins were pieced together by cartographers in the thirteenth century, without any attempt to bring them to a uniform scale, which would have been impossible, if a regular projection had been used. Besides, no convergence of the meridians or curvature of parallels could be detected, and hence the theories of Breusing and Fiorini fell to the ground.

Mr. H. Yule Oldham urged the importance of the study of mediæval maps as a guide in history, these being often found to be ahead of historical records.

Professor A. Penck's paper on the Morphology of the Earth's Surface, read at the sectional meeting for Spéléogie and Mountain Structure, need only be mentioned, as a *résumé* of his exhaustive work on the same subject was contributed by Professor Geikie to the February number of the *S. G. M.* Professor J. J. Rein gave a description of the Spanish Sierra Nevada, correcting several errors that have been promulgated concerning it.

Its boundaries are: to the west, the tableland of Granada and the Valle de Lecrin, or Rio de Laguna; to the south, the upper valleys of the Guadalféo and Rio Adra; to the east, the Rio de Almería; to the north, the tableland of Guadix. Within these narrow limits the Sierra Nevada rises quickly, and attains in its culminating points, near the sources of the river Genil, a height of somewhat more than 11,400 feet, these summits being the Mulhaçén, the Picacho de Veleta, and the Alcazaba. Thus the Sierra Nevada is second in altitude only to the Alps among the mountains of Europe.

Its central mass consists of archaic rocks, especially clay, slate, and mica-schist, which form the whole crest and the principal peaks. A remarkable change, due to subterranean water and internal heat, that is going on in these rocks near their contact with Triassic rocks, Professor Rein was able to observe near the mineral springs of Lanjaron, in the Alpujarras. The rain had caused a remarkable landslip, where the mica-schist was exhibited in every stage of transformation from unaltered rock down to a very plastic clay of a grey colour. The schistose backbone is flanked on almost every side by Triassic deposits, especially limestone.

Writers on Spanish geography trace the crest of the Sierra Nevada from the Cerro del Caballo to the Suspiro del Moro. Professor Rein condemned this view on the grounds that this mountain belongs to the Triassic formation, and is quite detached from the Sierra, as well as because petrographical character, strike and dip, prove that the range continues in a south-westerly direction, ending in the Loma de Lanjaron. In the deep and narrow Barranco de Lanjaron Mr. J. Macpherson found geological evidence of former glaciation. The river Genil rises not in the Corral de Veleta, as generally stated, but in the Laguna Larga, on the north side of Mulhaçén. To the east of this mountain the Sierra Nevada diminishes considerably in elevation, its highest point, the Chullo, being only 8566 feet, and the crest expands into a tableland till it ends with the Cerro de Montenegro, near the Rio de Almería.

The summer in these mountains is very different from that in the Alps. The changes between the heat of day and the cold of night, and from air very dry and pure to one almost saturated with moisture, are very striking. The range of the

thermometer in the highest parts during the latter half of August is often as much as 43° F. A prominent point of the Sierra would form an excellent meteorological and astronomical station. During the work of triangulation to connect the networks of Spain and France observatories were erected in 1879 on the peaks of Mulhaçén and Tetica. The astronomical results were published nine years ago, while the meteorological seem to have been buried in the archives at Madrid. Professor Rein dealt also with the vegetation, etc., of the Sierra.

A sectional meeting on Morphology of the Earth also met on Friday, Dr. Waumann, Professor Penck, Senhor Batalha Reis, and Professor Gerland taking part in the discussions. On Saturday the only paper read was one by General Annenkof on the importance of geography in connection with the present agricultural economical crisis.

It will be seen that the papers read at the Congress were in general, as might be expected, reviews of the work already accomplished and projects for future efforts, rather than new contributions to science. Thus the assembled geographers, with the help of the discussions, which in most cases were an important part of the proceedings, were able to obtain a clear view of the duties that lie before them. The conclusions they arrived at were considered by committees appointed for the purpose, and embodied in the resolutions and proposals which were submitted on the last day, Saturday, to the concluding general meeting. Nine such resolutions received the approval of the Congress. The first was General Chapman's proposal with reference to the Mapping of Africa, on much the same lines as laid down in the letter already referred to. With regard to Professor Penck's proposed Map of the World, the chief points were a recommendation that a poly-conical projection be adopted, each sheet being bounded by arcs of parallels and meridians, and that the meridian of Greenwich and the mètre be accepted. General Tillo's proposal, that Tabular and Cartographic Catalogues of all the original topographical sources for all countries and every geographical region be compiled, that in every country a central organ should be charged with the collection of all the cartographic material of the given country, and that an International Cartographical Association be constituted, was next approved of. The Congress also recognised the importance of recent Research in the Baltic, North Sea, and Atlantic, and expressed its opinion that the work should be extended on the lines proposed by Professor Pettersson. It also recognised the utility of an international system of stations for the observation of Earthquakes, as proposed by Professor Gerland. The pitiable state of Geographical Education in these islands formed the subject of a resolution, in which the Congress expressed its opinion that in every country provision should be made for higher education in geography, either in the Universities or otherwise. Two resolutions dealt respectively with the appointment of an international committee on Geographical Names and the foundation of an International Institute of Geographical Science. State Printed Registration of Literature, and the Development of Tropical Africa on the lines laid down by M. Dècle, next received attention. M. Jacques Leotard submitted a resolution that all Maps should be dated, and the nomination of a special commission was voted, on the proposal of M. de Rey-Pailhade, to study the application of the

Decimal System to time and angles and a system of time zones. A proposal of M. Mulhaupt de Steiger relative to the Resolutions of the Congress and reports of geographical progress, and a petition by Dr. Ricchieri for a commission to fix the limits of the Parts of the World, concluded the list.

In connection with the Congress a large exhibition of geographical appliances, surveying instruments, maps, photographs, etc., was arranged by Mr. E. G. Ravenstein and Mr. John Thomson, and Dr. H. R. Mill gave geographical lantern demonstrations. Among the exhibits which excited most attention was the Cosmosphere, invented by Mr. W. B. Blaikie, who explained its movements. This is the apparatus which the inventor showed nearly two years ago in its embryonic stage at his lectures in the Society's Hall.

The next International Geographical Congress will be held in Berlin.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Visit of Members of the International Geographical Congress to Edinburgh.

A number of members of the Congress accepted the invitation of the Council to extend their northern excursion to Edinburgh, where they arrived on the night of the 9th August from Liverpool. The party consisted of Professor Amrein of St. Gallen, Señor R. Torres Campos of Madrid, Dr. Schumacher-Kopp of Lucerne, Dr. R. Oberhummer of Munich, Professor Penck of Vienna, Dr. Poussié of Paris, Señor and Señora Vera of Madrid, and Professor Wagner of Göttingen. Prince Roland Bonaparte, General Annenkoff, and Professor Brückner of Bern, who had also accepted the invitation, were, at the last moment, prevented from attending.

Our guests met at the Society's Rooms next morning, and, after a brief address of welcome by Dr. John Murray, were driven, under the guidance of Mr. Ralph Richardson and accompanied by several members of the Council and officials of the Society, to visit Holyrood Palace, the private apartments of which were, by the courtesy of the Lord Chamberlain, opened for them ; and they then proceeded to the Castle, where, by special permission of the General Commanding the Scottish District, they were enabled to see several places of interest not ordinarily accessible.

After luncheon at the Waterloo Hotel, the party, guided by Mr. John Cockburn, went by train to Dalmeny to see the Forth Bridge. By the courtesy of the North British Railway Company the train from the Waverley Station at 2.10 P.M. was stopped at Dalmeny, and the visitors were allowed to walk on the bridge. Having inspected it as far as the first cantilever, they viewed the bridge from the deck of a steamer, and then returned to Edinburgh. They were entertained at dinner by Dr. John Murray, and afterwards attended an evening reception given in their honour by the Misses Stevenson.

On the following afternoon our visitors were conducted by Professor Geddes round a portion of the Old Town, and were then driven out to Colinton House, where they were hospitably entertained by Colonel and the Hon. Mrs. Trotter. In the evening they attended a reception given by Professor and Mrs. Geddes ; and the party dispersed next morning.

The Lord Provost, Magistrates, and Town Council had intended to receive the members of the Congress officially, but the project had unfortunately to be abandoned, as it could not be carried out on the only date that could be fixed for their visit to Edinburgh.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

The English Lakes.—Dr. H. R. Mill's survey of the English Lakes has been more than once referred to in the pages of the *Magazine*, and in vol. x. p. 456 a table of the dimensions, etc., of the lakes was given. In the *Geographical Journal* for July and August, Dr. Mill publishes a full account of his work, with maps, sections, and diagrams of each lake. It is impossible to condense this mass of information into a note of moderate length, but one or two general conclusions may be recorded. As regards the orography of the country, the Lake District may be looked upon as carved out of a huge dome cleft by two long depressions. The eastern depression, containing Thirlmere, Grasmere, Rydalwater, and Windermere, rises only to 800 feet above the sea, at Dunmail Raise. The western cleft is crossed by a narrow ridge, that of Stake Pass, 1500 feet high, and contains Derwentwater, the old lake beds of Borrowdale and Langdale, and Coniston lake. For the most part the symmetry of the Lake District bears no relation to the present geological structure, but is due to the original dome-shaped mass in which the valleys have been eroded. This is well illustrated in a sketch-map on which concentric rings are drawn, a point midway between Stake Pass and Dunmail Raise, lying on the western slope of High Raise, being taken as the common centre. With the help of these circles it is easily seen that the lakes radiate from this centre, with their extremities or other well-defined points lying approximately on the same circles. For instance, the circle of nine miles radius passes through, or close to, the deepest parts of Windermere, Wastwater, Coniston, and Esthwaite, and across the alluvial flats which separate Buttermere from Crummockwater. This circle Dr. Mill calls the central line of the Lake District. Besides the nine great radiating valleys, there are several important valleys which do not now contain lakes, but where the streams traverse long stretches of meadow-land bearing unmistakable marks of their former existence. Four of these are mentioned —the valleys of the Esk and Duddon in the south-west; Great Langdale continuing the line of the upper part of Windermere; and Long Sleddale in the south-east, between Windermere and Haweswater. There are two instances of valleys sloping inwards, towards the centre of the district, namely, those of Loweswater draining into Crummockwater, and of the Glenderamackin beck on the slopes of Skiddaw. These suggest a raising of the rim of the wheel of lakes, and such a raising would, according to one geological theory, account for the formation of the lakes by the elevation of the lower ends of early erosion valleys. Another theory attributes their formation to the abrasion of the ice-cap which once covered the district, as it flowed outward from the orographical centre, and to the action of the glaciers which marked its gradual disappearance.

After giving details of the work done, with the assistance of Mr. Heawood, in each particular lake, Dr. Mill has a few words to say on the general conclusions to

be drawn from it. Excluding Thirlmere, which was being converted into a reservoir for the Manchester Water Works while the survey was being made, and the tarns, we may distinguish two types of lakes, the shallow and the deep. The former includes Derwentwater and Bassenthwaite, the broadest of all the lakes; they average only 18 feet in depth, and their average is only 25 per cent. of their maximum depth. The beds of these lakes may be described roughly as an undulating plain. All the other lakes belong to the second type. The shallowest has an average depth of 40 feet, and the average varies from 36 to 61 per cent. of the maximum depth, the sides being, consequently, steep. The most characteristic lie in long narrow valleys with steep flanks, the slopes of which are continued under water with equal, or even greater, steepness, and terminate in a nearly flat floor.

Thirlmere, Buttermere, and Crummockwater lie fairly symmetrically in the centre of their drainage areas. Windermere, Coniston, Wastwater, Ennerdale, Derwentwater, Bassenthwaite, and, less distinctly, Ullswater, lie close to the watershed, and it is interesting to notice that the axis of maximum depth follows the same plan, running almost along the centre in the former, and near the left bank in the latter group. Mr. Heawood remarks that in the case of lakes dammed back one would expect to find a gradual deepening from above downwards, but that such is by no means the rule in the English lakes. Only in Buttermere and Crummock (considered as one basin) does the deepest spot occur at the lower end, and even here an important depression is found quite at the upper end. The rule seems to be that the greatest depths are found where the high ground slopes most steeply to the water. Here the drainage basin is more restricted, and less detritus is carried into the lake, and the shallowing at the lower ends of the lakes is a natural corollary to their radiate arrangement, the drainage areas spreading out towards the outer circumference. The lakes as a whole reach just to the beginning of the level country, and this fact is an extension of the above principle, and shows that there has been no damming-up, for there is no point so low as the bottom of the lakes within many miles from the hills; indeed, in some cases, the lake beds reach down considerably below sea-level.

ASIA.

The Frankincense Country.—It is generally known that Mr. Th. Bent's late attempt to reach the Hadramaut valley from Muskat was unsuccessful. He was, however, able to make some excursions into Southern Arabia from the coast, principally the Dhofar district, where frankincense is gathered. Mr. Bent reached Muskat in December last, which, he says, in many respects resembles Aden. It has a good harbour, and is surrounded by arid volcanic mountains. On paper the territory of Oman is exceedingly large, extending to the north as far as the Turkish limits, and westwards for a distance of over 700 miles, including Dhofar. The authority of the present Sultan, however, is confined to the two towns of Muskat and Mattra, and the small strips of fertile land contiguous to them, and had it not been for British protection, he would long ago have succumbed to the attacks of the chiefs of the interior and the ambitious projects of his brother. The Omani form a third Mohammedan sect, distinct from the Sunnites and Shiites, holding that an Imam must be elected by the votes of the faithful. Muskat has few architectural attractions, and its aspect is one of squalor and dirt; few more unhealthy places can be found in the world. The suppression of piracy and the introduction of steam have reduced it to its normal condition—that of a date-exporting harbour. Its population is a strange medley of Indian and Persian

merchants, colonies of Beluchis from the Mekran coast, Negroes from Zanzibar and Somaliland, and Bedouins from the mountains. The scenery around is peculiarly fantastic and weird, but absolutely arid and unproductive, except where a few gardens are maintained by irrigation. The coast-line, too, is very fine, with its beetling cliffs of black and green tufa, the home of countless sea birds. Mattra, the commercial centre, from which all the roads into the interior start, is about three miles distant.

Dhofar is 640 miles by sea from Muskat. Eighteen years ago the country was in such a state of internal dissension that the inhabitants applied for help to Sultan Turki of Muskat, who sent Wadi Suleiman to restore order. This man has shown remarkable strength of character, and has now ceased to send tribute to Muskat, intending probably, when an opportunity occurs, to declare himself independent under British protection. Dhofar, and the Gara mountains which encircle it, form a very marked interruption in the arid coast. From Cape or Ras Risut to Mirbat extends a long narrow alluvial plain, never more than nine miles wide, and a mere strip at the eastern end where the mountains come down almost to the sea. It is well-watered and very fertile, and produces tobacco, cotton, maize, and other kinds of grain in great abundance ; in the gardens the plantain, papaya, mulberries, melons, and other fruits flourish. The great drawback to the progress of this country is the want of a good harbour. Between Mirbat and Risut there is nothing but open roadsteads, with a rough surf rolling in, and it was with considerable difficulty that Mr. Bent landed at Al Hafa in small hide-covered boats specially constructed to ride over the surf.

Mr. Bent and his party traversed the whole plain in various directions, and found the sites of ruined cities at no fewer than seven different spots. Good anchorage formerly existed, and at Taka there was a deep and extensive harbour which could easily be restored with a small outlay of capital. At Al Balad, two miles east of Al Hafa, there are ruins of a town which, no doubt, formed the capital of the district in ancient times. The ground is covered with the remains of Sabæan temples and Mohammedan mosques. A series of ruins connects this site with Robat, two miles inland, where there are also extensive ruins. This country is no doubt the Μαντεῖον Ἀρτέμιδος of Ptolemy, and Sprenger (*Alte Geographie Arabiens*) identifies Zufar and the later Mansura with the ruins of Al Balad, and associates Abyssapolis with Mirbat—conclusions quite in accordance with the existing evidence.

Having obtained a convoy of the Gara tribe, a very wild people, with camels equally wild, Mr. Bent left Al Hafa, and passing near to Cape Risut, through woods of frankincense-trees, and ascending the Wadi Ghersid, a valley covered with the richest tropical vegetation, reached the Gara mountains at its head. In these mountains, which culminate at a height of not more than 3000 feet, the Bedouins live in caves, and their herds of camels, goats, and sheep are scattered over the country grazing on the abundant grass. As the mountains descend to the north, the country becomes more and more arid, and the vegetation, gradually becoming more sparse, ends at last entirely in the yellow desert of Nejd, which extends as far as the eye can reach. Descending the Wadi Nefas, the party passed a natural hole, 150 feet deep by 50 in diameter, surrounded by ruins, which Mr. Bent identifies with the site of the Addite oracle, mentioned by Ptolemy and others. At Taka were found the remains of an important town, probably the old Mirbat or Abyssapolis. An hour's walk to the east, the estuary of a river forms a lake, called by the natives Kho Rowri, which was no doubt the port of the ancient city. Riding inland for some four or five miles, the party pitched their camp at the foot of a very singular natural phenomenon. The valley has been filled up by

a calcareous deposit, which now forms perpendicular cliffs, 550 feet high, on either side of an isolated hill about 1000 feet in height. On ascending the hill, and thus reaching the country above these precipices, the travellers found a perfectly flat grassy plain, where Gara herdsmen feed their cattle. A narrow lake feeds several streams which fall in cascades over the abyss, and in dry weather are dammed up to irrigate the fields.

After leaving Dhofar, Mr. Bent attempted to reach Hadramaut through the Mahra country, and also from Sheher, but the sultans of these places refused to assist him, and the plan had to be given up for this year.—*Geogr. Journ.*, Aug.

Rainfall in China.—Dr. Doberck's observations were alluded to in vol. v. p. 95. Since then he has published later results, for the years 1890-92, in the *Observations and Results at the Hong-Kong University*. The information he has collected is from observations extending over from 5 to 7 years at 33 stations, which Prof. Raulin groups as follows (*Symons's Monthly Meteor. Mag.*, June):—(1) Southern coast of the Gulf of Pe-chi-li; (2) River Yang-tse-kiang; (3) Delta of the Yang-tse-kiang; (4) coast from Wen-chau to Swatau; (5) Canton and Hainan; (6) Formosa. The annual rainfall is small in the north and increases greatly towards the south. From about 20 inches in the Gulf of Pe-chi-li it increases to double that amount in the delta of the Yang-tse-kiang, while at Hang-chau, 500 miles up the river, it is 58 inches. Along the coast southwards it is about 45 inches, but reaches 68 inches at Ningpo. At Canton it is 66 inches, in the north of Hainan 54; in Formosa it ranges from 60 to 90 inches, while at Kelung, the north-east point, it reaches 148 inches. Notwithstanding the proximity of most of the stations to the sea, the *régime* is that of type I., which prevails over the greater part of Asia. The exceptions are Fu-chau, Middle Dog and Chapel Island, where the spring rains slightly exceed those of summer. The southern part of Formosa has also type I., but at Kelung, its northern extremity, we have the opposite, type IV, and at Tamsui, not far off, the intermediate type III. Prof. Raulin gives a table of the rainfall for the four seasons and the whole year.

AFRICA.

The Crossings of Africa.—Professor Paul Barré enumerates, in the *Revue de Géographie* for May, the twenty-five expeditions in which Africa has been crossed from one coast to another. As such records are useful for reference, we give M. Barré's list in a condensed form. In 1800 F. C. Hornemann left Tripoli, and having passed through Bornu and Nupe, died at Bakhain, near Rabba, in 1801. Honorato da Costa left Angola in 1802, and reached Tete on the Zambesi in 1811. The brothers Pombeiro also left Angola in 1802, and, travelling through Muata Yamvo, Kazembe, and Tete, reached the mouth of the Zambesi in 1814. In 1838 Major F. J. Coimbra started from Mozambique, visited the lakes to the north of the Kalahari desert, and came to Benguella in 1848. Silva Porto traversed the continent from Benguella to the mouth of the Rovuma, between 1852 and 1856, visiting Bihe and the Upper Zambesi. David Livingstone, leaving St. Paul de Loanda in 1854, and descending the Chobe and Zambesi, arrived at Quilimane in 1856, after a journey of 2500 miles. Dr. Gerhard Rohlfs crossed from Tripoli to the mouth of the Niger, passing Lake Tsad, between 1865 and 1867. In 1873 Commander V. L. Cameron left Bagamoyo and, by Tabora, Lake Tanganika, Lake Kassali, and Bihe, came to Benguella in 1875. H. M. Stanley, in 1874-77, travelled from Bagamoyo to the lakes Victoria, Albert, and Tanganika, and from Nyangwe descended the Congo to Boma, having

covered more than 7000 miles. Major Serpa-Pinto crossed, in 1877-79, from Benguella to Durban, passing the sources of the Chobe, the Victoria falls, the Kalahari desert, and Pretoria. Dr. M. Pellegrini and Lieutenant M. Massari travelled from Suakim through Kuka to Akassa in 1880-81. In 1881 Major von Wissmann left St. Paul de Loanda, visited Muata Yamvo, Nyangwe, and Tabora, and arrived at Saadani in the following year. A new route was followed by the Marquis de Buonfanti, who left Tripoli in 1881, and passed through Kuka, Say, and Timbo in Futa Jallon. Mr. Arnot, a Scotch missionary, travelled, in 1882-84, from Durban to Benguella. Brito Capello and R. Ivens crossed from Mossamedes to Quilimane, passing Lake Moero and the sources of the Lualaba, in the years 1884 and 1885. Lieutenant Gleerup, in the service of the Congo State, ascended the river in 1883 to Stanley Falls, where he remained two years, and then by Nyangwe and Tabora reached Bagamoyo in 1886. In 1879 Dr. W. Junker left Cairo for the Upper Nile, through Suakim and Berber, and after exploring the Bahr-el-Ghazal, the Welle, and the Aruwhimi, took refuge with Emin Pasha at the time of the Mahdist insurrection, escaping to Zanzibar in 1886. Dr. Oscar Lenz started from the mouth of the Congo in 1885, visited Tanganika and Nyassa, and descended the Shire and Zambesi to Quilimane. In 1886-7 Major von Wissmann crossed the continent a second time, founding the post of Luluaburg, and visiting the Sankuru and Tanganika. He reached the coast at Quilimane. Mr. H. M. Stanley made his second crossing in 1887-89, when in command of the famous Emin Pasha Relief Expedition, and in his company Emin Pasha and Captain Casati completed their travels across the continent, the former having left Cairo in 1876, and the latter Suakin in 1879. Captain Trivier travelled from Loanga up the Congo and by the lakes Tanganika and Nyassa to Quilimane in 1888-89. Commander L. Monteil left St. Louis in Senegal in 1890, and, crossing the great bend of the Niger to Say, visited Kuka and reached Tripoli in 1892. Lionel Décle travelled from the Cape through Fort Salisbury and Blantyre to the lakes, and from Uganda passed through Masailand to Zanzibar. His journey took place in the years 1891 to 1894. Lastly, Count von Götzen, starting from Pangani in 1893, passed through Ruanda, and, having discovered Lake Kivu, descended the Lowa and the Congo to Matadi, where he arrived in 1894.

AMERICA.

Canal Schemes in Central America.—British shipowners are not enthusiastic about the prospects of a canal between the Atlantic and Pacific. They consider that the route to the East by the Suez canal is much more advantageous owing to the frequent opportunity of taking in cargo and coal by the way ; whereas vessels crossing the Pacific must have a large proportion of their stowage room occupied by coal, and pass only islands much too small to supply a large trade. Nor do they expect that the commerce with Peru and Western Mexico will compensate for these drawbacks. A great objection to the Nicaragua canal scheme, on which notes have been published in vol. iv. p. 54 and vol. v. p. 48, is the large amount of masonry required, and that in a country very subject to earthquakes.

Another route has been suggested, leaving the Caribbean Sea at San Blas to the east of Colon. Its length is only 30 miles as compared with 46 by the Panama, and 170 by the Nicaraguan route. It also possesses natural harbours at both extremities ; out of the 30 miles only 20 would require excavation, the remainder being along the Bayano river, in which ample room for navigation could be obtained by dredging. Another point in its favour is that the whole canal would be at sea-level, and thus the risks attending locks would be avoided, and

there would be no inconvenience from want of water. On the other hand, a tunnel 7 miles in length would be needed. It would be 120 feet high by 80 wide, and would entail the striking of topmasts and the hauling round of yards. Were a ship in the tunnel during an earthquake, its position would be serious. The cost of a canal by this route, with a depth of 28 feet and a width of 125, outside the tunnel, is estimated at £26,000,000. Another route proposed is from the Gulf of San Miguel on the Pacific side to Caledonia Bay, a distance of 24 miles. To maintain the sea-level a tunnel 2½ miles long would be necessary.—*The Nautical Magazine*, August.

Puerto Rico.—Neither the Spanish government nor Spanish private individuals have taken the trouble to investigate the geography of this island, and the knowledge hitherto obtained is almost confined to a short notice contained in T. P. Cleve's work *On the Geology of the North-Eastern West Indian Islands (Kong. Svenska Vetenskaps Akademiens Handlingar*, 1870). The island has an area of about 3500 square miles, and a population, according to the census of 1889, of 806,708 inhabitants, giving a density of about 230 to the square mile. No dangerous creature is found on the island, neither reptile nor beast of prey. The heat is not excessive, the thermometer rarely rising above 90° F., but the great humidity renders the climate unhealthy, causing yellow and malarial fevers. Its mineral wealth consists of mineral springs, mines of iron, gold, zinc, and coal, stone quarries, and deposits of gypsum and phosphates, but, except the phosphates and the springs, these natural resources have not yet been developed. Means of communication are as yet too few. A line of railway, 318 miles long, is, sometime or other, to encircle the island, but at present only sections, covering in the aggregate a distance of 130 miles, have been constructed. Six main highways are to intersect the island, but only that from the capital to Ponce is at present fit for wheeled traffic.

In 1892 Dr. Wilhelm Sievers crossed the island from Arecibo to Ponce. Coming from St. Thomas, he was struck by the welcome contrast to the hot and dry Virgin Islands presented by the long rows of coco-palms, fresh meadows, and cloud-capped mountains. The capital also, San Juan de Puerto Rico, with its large public buildings, extensive fortifications, and numerous churches, has an imposing appearance to the traveller entering its busy harbour; but the interior of the town is less charming on a nearer acquaintance.

Being unable to procure riding animals for his journey in San Juan, Dr. Sievers took the train to Arecibo. The railway, forty-seven miles long, crosses from the island on which the capital is built to the mainland by an iron bridge, and runs between the mountains and the swamps of the coast. Arecibo was founded only in 1778, and, owing to the absence of a good harbour, is never likely to rival San Juan in size and trade. Nevertheless, it is of some importance as the headquarters of the sugar industry, and the outlet for the fruitful valleys of the Rio Grande and its tributaries, where coffee, tobacco, bananas, and sugar are cultivated. Here, also, horses were not to be had, but Dr. Sievers accepted the offer of a doctor to drive him to the plantation of El Jobo, the property of a German, a drive of three hours. In less than two hours they began to ascend the main chain of mountains, a mighty mass of Miocene limestone that runs all along the north side of the island. The view was lovely; the river ran below between huge walls of rock, with cliffs like those of Saxon Switzerland, and on the grassy slopes stood thousands of palm-trees; above, on the jagged mountains, were houses and huts; below, extensive sugarcane fields, and everywhere life and movement. The fresh air of the plantation at an elevation of 935 feet was very welcome after the heat in San Juan and Arecibo.

On August 22nd Dr. Sievers left El Jobo on horseback, and passing through Utuado, a town of 2000 inhabitants, where the heat was oppressive, the elevation being only 430 feet, he soon after entered a thickly wooded country, where the path followed the right bank of the Rio Grande amidst large plantations of bananas, which here replace the palms of the lower grounds. At 4 P.M. he came to Las Adjuntas, a village of 600 or 700 inhabitants, situated at the confluence of two headwaters of the Rio Grande at an elevation of 1394 feet, and then ascended to the pass, 2230 feet high, which crosses the chain traversing the southern third of the island. Beyond the watershed the descent was somewhat more gentle. The path was exceptionally bad, even for a mountain track, but surrounded by luxuriant vegetation, which, however, grew only in the valley of the Rio Cañas, while the slopes of the mountains suffered from greater dryness than the northern side of the island. The new road was in course of construction, and on joining the section already finished, Dr. Sievers travelled more comfortably down to Ponce. This town has a population of, perhaps, 30,000 inhabitants, and is the seat of an active trade. In little more than a century it has become the greatest commercial centre in the island, in spite of its bad harbour, where ships have to anchor far out from the town.

The highest point on the route from Arecibo to Ponce, 2230 feet high, lies at a distance of 26 miles from Arecibo, and 14 from Ponce. Another axis of elevation is perceptible between Arecibo and Utuado, 8 to 10 miles from the former, and has a height of about 1000 feet. Between lies a hollow at an elevation of 360 to 460 feet above sea-level. These observations are in accordance with the orographic system usually depicted on maps. In the southern third of the island is a range running from east to west, with heights of 2600 to 3300 feet high, and the northern part is a mountain land usually 1000 to 1600 feet in height, but gradually rising in the east until, in the Sierra de Luquillo, it culminates in El Yunque, 4985 feet, the highest point in Puerto Rico.

On the northern side, between Arecibo and Utuado, the mountains are composed of light grey limestone containing fossils, most of which are found in the Miocene deposits of Jamaica. In the neighbourhood of Utuado and in the valley of the Rio Grande, the underlying rocks are exposed, and consist of greyish red sandstone, eruptive rocks, and metamorphic stratified rocks, and the so-called "Bluebeach," a conglomerate of felsite and porphyry. These rocks are assigned by Cleve to the Cretaceous formation. Between Utuado and Las Adjuntas, besides grey and red slates, the prevailing rock is a diabase porphyrite, and beyond Las Adjuntas, on the way to Ponce, a brown, marly, clayey limestone occurs, and a diabase breccia, perhaps the "Bluebeach" of the Virgin Islands. Upon it lies, on the southern slope, compact, light grey sandstone.—*Mitth. der Geogr. Gesell. in Hamburg*, Heft 2, 1891-92.

Haiti.—The Republic of Haiti occupies the western part of the island of San Domingo, having an area of about 8540 square miles, or about a third of the whole island. Vast forests and lofty mountains cover the country; the coasts are much indented and perilous to navigation. On the north, south, and west are luxuriant lowlands, watered by numerous streams running across them in every direction. The loftiest mountains are in the Western Department, where the Selle rises to a height of 8900 feet. The most important river is the Artibonite; it has a length of about 196 miles and is in part navigable by small vessels.

The climate is moderate, but, as in all equatorial lands, the heat in the months from June to September is intolerable, particularly in the low lands, while on the plateaus during the rainy season the temperature is almost cold. Haiti is often

visited by furious hurricanes which destroy whole plantations. Earthquakes also are rather frequent, and in the northern part are remembered with horror. The chief diseases are fevers, malaria, dysentery, insanity caused by the abuse of alcoholic liquors, and consumption. From time to time yellow fever is introduced from Cuba. Cholera epidemics have never occurred, in spite of the dirtiness of the towns.

The population, according to a census taken by the French clergy and published in 1894, numbers 1,210,625. The people are mostly descendants of African slaves. The Haytian is, in general, kind and hospitable, but ambitious, and hence arise the frequent revolutions which afflict the country and impede its progress. The official language is French, but Creole, a corrupted French, is in general use.

Agriculture shows little sign of improvement, for which several reasons may be assigned—the numerous labourers called away for military service, the civil wars, the absence of immigration, etc. Were it not for these impediments, the immense resources of the rich soil of the country would be rapidly developed. Coffee is a marvellous source of wealth ; the soil is particularly favourable for its growth, and in the mountains the plant grows wild and is renewed from the seed that falls to the ground. During the colonial period sugar was the chief product of the island, but all that is grown now is used to make rum and coarse spirit, which the people drink in large quantities. The production of coffee has also fallen off considerably. Industry is at the same low ebb as agriculture. The principal exports are coffee, cotton, rum, cocoa, logwood, mahogany and other woods, tortoiseshell, pepper, and fruits.—*Boll. del Ministero degli Affari esteri*, Jan.

AUSTRALASIA.

The Voyage of the "Borneo" along the Coast of New Guinea.—Dr. Meyners d'Estrey gives a short account of the voyage of this vessel in the *Revue de Géographie*, July 1895. The object of the expedition was to ascertain whether there existed on the south coast a river of sufficient size to be navigable by a small steamer at all seasons. The *Borneo* anchored near the island Vleermuis, and some of the crew landed almost daily, being well received by the natives. This island, covered with vegetation, is never less than 10 or 12 feet above the sea at the highest tides. Coco palms are numerous, and paths lead in every direction. The opposite coast of New Guinea is skirted by coco-nut woods, and a long bank of sand extends in front of it. To the west of Selerika no navigable river could be found, and therefore Commander Velthuyzen steered eastwards as far as Thursday Island. On the way the mouth of the river Dewinka was visited. Its breadth was estimated at 1600 yards and its depths at 3 fathoms. The banks are high and covered with vegetation. M. Velthuyzen maintains that the river is navigable at all seasons by vessels of considerable draught.

That the population is very numerous may be judged from the fact that in lat. 8° 11′ 16″ S. and long. 139° 41′ 22″ E. the ship was visited by forty-three *praaus* each manned by ten to fifteen individuals. The natives are strong and well-built, with dark complexion and frizzy hair. They live on sago, coco-nuts, pork, and kangaroo. Both men and women stain the face and hands with red, black, and white dyes. Almost all the women are tattooed on the breast, the operation being performed with a sharpened shell. The men are lazy, and carry on no trade with the interior.

Artesian Water in Queensland.—It is well known that the great obstacle to the development of many parts of Australia is want of water, and that large numbers of sheep and cattle often perish by drought. The staff of the Geological

Survey of Queensland has therefore turned its attention to Artesian water, with much success, as is recorded by the Government Geologist, Mr. Robert L. Jack, in the first *Bulletin of the Geological Survey*.

The bulk of the rain which falls in Queensland is intercepted by a belt of elevated country near the coast. The rainfall to the west amounts to only a half or a third of the quantity that falls in the eastern districts. Owing to the nature of the soil the interior produces grasses far superior to those of the coast, but in the long dry periods the rivers dry up for the most part, and thus only a small proportion of this magnificent land, within a certain radius from permanent sources of water, can be grazed. In 1883 cattle and sheep died by hundreds of thousands, and even some of the towns in the west were threatened with extinction from want of water. Mr. J. B. Henderson, hydraulic engineer, and Mr. Jack were then sent out to study the country and determine the suitable spots for Artesian wells, if there seemed to be a fair chance of success in boring. There are now some 200 bores in the interior, capable of producing 125 million gallons a day. For comparison *Natural Science* for June mentions that the daily supply of London is 171 million gallons.

Very nearly all the water drawn up by Artesian wells comes from the Rolling Downs or Lower Cretaceous formation. On this the Upper Cretaceous or Desert Sandstone lies unconformably. Originally it covered an area of at least 500,000 square miles, but is now reduced to isolated table-lands. At the base of the Lower Cretaceous formation is a series of soft, grey, very friable sandstones, grits, and conglomerates. The sandstone absorbs water with avidity, and being destitute of cement is quickly disintegrated by water. To this rock the name "Blythesdale Braystone" was given, because it is well developed at Blythesdale, near Roma, and closely resembles a stone much used in Scotland for scouring purposes and called braystone. The outcrop of the Blythesdale Braystone has not been mapped, but it probably extends in Queensland for a distance of 1000 miles with an average breadth of 5 miles. Accordingly there is a gathering ground of 5000 square miles. It may be also, Mr. Jack affirms, that sandstone beds of Triassic age underlying the Blythesdale Braystone feed this formation and compensate for the loss it probably suffers through connection with the sea.

A High-Level Observatory in Tasmania.—In May last Mr. Clement Wragge established a meteorological observatory on Mount Wellington, four miles in a straight line from Hobart. At the Springs, 2495 feet above sea-level, Mr. Wragge fixed on Constable Gadd's quarters as a half-way observatory, and he will shortly place there thermometers and a barometer. Later on, a barograph, thermograph, and hygrograph will be set up at the Springs. When the party arrived at the summit, 4166 feet above sea-level, a cairn already commenced to protect the instruments on a pile of jagged rocks 150 yards west of the pinnacle was completed. Here the instruments were placed, most of them self-registering, and of the latest and most approved types, an enlarged Stevenson screen being used for the thermometers, as at Hobart and the Springs. In the meantime they will be read once a week, but a permanent observatory is in course of erection, and, when it is finished, observations will be recorded daily. The thermometer on the summit marked 42° at 3 P.M. Mr. Wragge was assisted by Mr. Kingsmill of the Hobart Observatory, and by Captain Balfour of the *Penguin*, a member of this Society, who placed six sailors at his disposal. Mr. Wragge expects great results from the work on Mount Wellington, which is nearly a counterpart of Ben Nevis in height, and within 14° of its distance from the Equator. With the Hobart Observatory 160 feet above sea-level, the Springs station and the summit observatory, there

will be ample opportunities for comparing meteorological phenomena at different elevations.

MISCELLANEOUS.

Last month the construction of the railway from **Fontesvilla to Beira** was commenced.

A society has been formed in France for the study of caves and underground rivers. It is styled the **Société de Spéléologie**, and it has issued the first quarterly number of its bulletin, *Spelunca*. M. E. A. Martel is the general secretary.

A scientific expedition to the summit of **Mont Blanc** has been organised by M. Janssen, who is to erect his new self-recording meteorological apparatus, M. Bigourdan, who will make experiments on the force of gravity, and M. Maurice de Thierry, who will continue the spectroscopical and chemical experiments commenced last year.—*Revue Scientifique*, July 27th.

According to a map accompanying the report of the chief engineer of the South Australian railways, the southern end of **Lake Eyre** at low water lies 38 feet below sea-level. The station of Stuart Creek to the south of the lake is 25 below sea-level. A long disputed point is thereby settled. For Lake Torrens the height is given as 100 feet (probably round figures) above sea-level.—*Petermanns Mitt.*, Bd. xli. No. 6.

Apollinaire Fretz, an engineer, is about to make an expedition in the basin of the Jucurucu, a river which rises in the Serra dos Aimores, **Brazil**, and falls into the Atlantic to the north of Caravellas. As his route will traverse for more than 100 miles a region long unknown, and inhabited by tribes still untouched by civilisation, the results may be expected to possess both geographical and ethnographical interest.—*Globus*, Bd. lxviii. No. 5.

The island of **Trinidad** in the South Atlantic has been annexed by Great Britain. It is a howling wilderness of rocky peaks, 6 square miles in extent, lying at a distance of 600 miles from the Brazilian coast. There is no safe anchorage on any part of the coast. This is the island described by Mr. E. F. Knight in the *Cruise of the Alerte*.—*Nautical Magazine*, July. A writer quoted in *The South American Journal* speaks, however, more favourably of its suitableness as a port of call.

The **Saulte St. Marie Canal** has now been formally opened for traffic. It gives continuous navigation, for about 2384 miles, from the head of Lake Superior to the sea, and renders Canada independent of the United States as regards access to the lake. The length of the canal is about two-thirds of a mile, its width at low-water level is 152 feet at the surface, and its bottom width is 145 feet. Its depth is 20 feet at low-water. The lock on the St. Marie river is 900 feet long, 60 feet wide, and 22 feet below the lowest recorded river-level.—*Commerce*, July 31.

In the *Quarterly Journal of the Geological Society*, August 1st, Professor W. J. Sollas gives an account of an experiment with pitch, contrived to illustrate the motion of a **viscous fluid**. The pitch was poured into a long trough of wood, in four strata, inclined at an angle of 11° to 12°, and separated by thin layers of sugar, vermilion, and sago. The experiment was started on December 27th, 1894, and brought to an end on March 24th, 1895, fresh pitch having been added from time to time as the pressure due to gravity caused the upper end to sink. On the

miniature glacier being split down the middle, it was found that not only had the upper layers passed over the barrier at the foot, but also that the lower strata had risen steeply up towards the barrier. This experiment clearly illustrates, in Prof. Sollas' opinion, the movement of glaciers, and explains, among other things, the occurrence of boulders on the far side of a mountain, which have been brought from lower elevations. The observations of Dr. Drygalski and Prof. Chamberlin in Greenland have thrown doubts on the theory of the viscosity of ice, but, nevertheless, the above experiment is of great interest.

Mr. Alexander Bell, author of the *History of British Columbia*, writes that the view held by the United States respecting the southern boundary of Alaska is at variance with that held in British Columbia, and is not in accordance with the Russian treaty. It is there stated the boundary shall run from the southernmost point of Prince of Wales Island northwards along Portland Channel, between the meridians of 131° and 133° W. long., as far as the point on the continent where it strikes the 56th parallel of N. lat. This Portland Channel cannot be Portland Canal, as maintained by the United States, for the mouth of this inlet lies nearly due east of the southernmost point of Prince of Wales Island, and, moreover, eastwards of the 131st meridian. The name Portland Channel does not appear on Vancouver's map, on which the treaty was based, and must have been given by the framers of the treaty to the channel between Prince of Wales Island and Revilla Gigedo, as only by this channel could the boundary run northwards from the southern extremity of the former island. Mr. Begg supports his contention by quotations from letters of Sir C. Bagot and Sir L. Hertslet.

NEW BOOKS.

De Saint-Louis à Tripoli par le lac Tchad. Voyage au travers du Soudan et du Sahara, accompli pendant les années 1890-91-92 par le Lieut.-Colonel P.-L. Monteil, de l'Infanterie de Marine. Préface de M. le Vte. Melchior de Vogüé. Illustrations de Riou. Paris: Felix Alcan, n.d. Pp. x+463.

The mention alone of the three places named in the first line of the above title is sufficient to indicate a great and remarkable feat of travel, and though in the twenty-three months spent on the journey there must have been long and weary episodes, the agreeable style and sustained interest of the narrative never flag. Some readers might wish for more statistical description and less personal narrative. The author, however, promises a supplementary volume dealing with climatology, ethnography, and languages. His personal intercourse with the people, too, naturally illustrates much of the character, ways, and condition of the different races and classes. The more striking physical features of the country are, besides, not neglected. Thus, in describing the Mossi race and the peculiar features of their civilisation, the character of the plateau which they occupy is noticed, and the way in which the rivers diverge from a region of which Wegou may be taken as the centre, flowing towards the Volta and Comöe to the south and west, and north and east towards the Niger. After crossing the river at Say, he notices the peculiar depressions or ravines known as *dolhols*, which have been called rivers or water-courses, but which he believes to represent bays or inlets of the ancient sea which covered the present Sahara, and which disappeared owing to that elevation of the land which is evidenced most prominently by the ranges of the Atlas, the plateaus

of Tibesti, Borku, and Wadai, and the ranges between the Ubangi and the Nile—a movement which also cut off the Shari from its previous junction with the Nile. His arguments are plausible and ingenious, and we are far from disputing them, though we doubt whether our knowledge of the geology of Central Africa warrants our dogmatising on the subject. As regards the *dolhols*, their courses, he tells us, have no relation to the general slope of the land, but lie at various angles to it, while, unlike any river channel, they contract towards their lower ends. Farther east, near Kano, on the range which forms the watershed between the Niger and the lake, is the only tract of primeval forest met with on the whole route.

He has some interesting remarks on the great oasis lying between Lake Chad and Tripoli. The water, over a great region, seems to lie very near the surface, and here and there are low ranges or beds of limestone which possibly allow the water to accumulate, while they, at all events, hinder the encroachment of the sand. The oasis of Agadam, for instance, is bounded and protected north and east by such ranges, but is being gradually invaded by sand dunes on the south. A considerable part of the author's route lay through the semi-civilised Mohammedan States, and it is doubtful whether the calculated and elaborate hindrances which beset the travellers in these regions are not more serious than the ruder difficulties with more savage tribes. It needed all Colonel Monteil's diplomacy to combat them, and he gives amusing and graphic pictures of his interviews with sovereigns and ministers, of magnificent displays of cavalry, and wealthy caravans of merchants, incidentally adding some interesting details about those last, and of the extensive trade—which with greater security might be considerably extended—between the central Soudan communities, conducted chiefly by that essentially trading race the Haussas, and also, in the more easterly regions, between Kano and Tripoli, by Arabs.

From various facts he mentions we realise the vast changes which may pass over African society unrecorded. Thus he speaks of whole communities absolutely wiped out by cholera or other epidemics. Great changes are even now occurring, due to the widespread wave of disease which has ravaged the herds of cattle all across the continent. As the great pastoral nation, the Masai in the east, have had to choose between starvation and agriculture, so the chief pastoral people of West Central Africa—the Peuls or Foulbé—an exceptionally influential and intelligent race, have had their resources entirely crippled from the same cause. The resulting scarcity, both of food and of beasts of burthen, was frequently felt severely by the author.

Colonel Monteil was sent by the French Government, in 1890, to report on the country bordering on the line agreed on by the governments of Great Britain and France, as bounding their spheres of influence northward and southward respectively, a line drawn from Say on the Niger to Barrua on Lake Chad. Judging from his map he seems to have taken singularly little interest in the country on the French side of the line, having chosen a route well to the south of it. It is in this connection, perhaps, that we read a passage in M. de Vogüé's preface :—

"En Afrique, chacun le sait, ces attributions platoniques [as the aforesaid frontier line] restent subordonnées aux positions effectives, militaires ou commerciales, que les contendants se trouvent occuper, quand vient le moment de procéder à une délimitation plus sérieuse."

It would be interesting to know what M. de Vogüé might have to say as to the morality of this observation had it been uttered or acted on by a son of *la perfide Albion!* For an African diplomatist Colonel Monteil seems singularly ill-informed. Thus, he makes a treaty with Sokoto, a kingdom well within the British sphere, ignorant, apparently, of the journey thither and treaty contracted, in 1885, by

one of the most distinguished African travellers of these days, the lamented Joseph Thomson. Colonel Monteil denies further that any treaty has been made with Sokoto on the part of the Royal Niger Company. For this he has, he tells us—guileless diplomatist!—the word of the Wazir of Sokoto. The statement, however, is so entirely contrary to well-established facts that we need not pursue the subject, to which we should not have referred but for the prominent position of the writer.

The charm of such typography and paper as we have before us here, are great, and the work is further adorned by the clever and attractive illustrations of M. Riou, that well-known universal provider of authentic sketches of African travel.

The Century Science Series. Major James Rennell and the Rise of Modern English Geography. By Clements R. Markham, C.B., F.R.S., President of the Royal Geographical Society, etc. London: Cassell and Company, Limited, 1895. Pp. 232.

Mr. Clements Markham's Memoir of James Rennell, "the first and greatest of English geographers," is a most interesting book, and a valuable addition to the literature of geography on its historical side. The work derives special importance from the fact that, for a critical half century—from 1780 till 1830—Rennell was the leading geographer in England, if not in Europe. Mr. Markham's conception of the work and the qualifications of a geographer is very high, and as coming from him is exceedingly interesting. Finding his ideal realised to a large extent in Rennell, he writes with appreciation amounting to enthusiasm, as well as with a grace of diction and a fulness of knowledge that command respect. The opening chapters describing the early career of Rennell, his boyhood at Chudleigh, and his service as a midshipman in the old days when life at sea was rough and full of hardships, are conceived and worked out in a fine spirit. The real interest of the book, however, from the geographical point of view, begins with Rennell's appointment as Surveyor-General of Bengal at the age of twenty-one. That appointment, which finally severed his connection with the navy, was in part due to powerful private influence, but mainly to the remarkable skill he had shown as a surveyor, and a maker of charts and maps. From his earliest years he had shown a peculiar gift in that direction. Even before he went to sea, he had as a little boy made a plan of Chudleigh. During the disaster at St. Cast in 1758, while every one on board the frigates was anxiously on the look-out for troops, "young Rennell on board the *Brilliant* was ready to take bearings and make a plan of the scene of operations." On the voyage to India, he surveyed every port at which the ship called. He subsequently surveyed and made charts of Trincomali Harbour, Palk Strait, and the Pamben Channel. As Surveyor-General of Bengal, soon accompanied with the rank of Captain of Engineers, Rennell rendered invaluable services both to the East India Company and to geographical science. He made the first complete survey of Bengal; he prepared for Lord Clive a map of Bengal, Behar, and Orissa. The results of his field work, which occupied several years, and involved the surveyor in many dangerous enterprises, were given to the world in his famous "Bengal Atlas" in 1779. By that time he had retired on a handsome pension and with the rank of Major, and had returned to England. Then began those comprehensive labours which entitled him to be regarded as the greatest of living geographers—his Map of Hindostan, his works on the geography of Herodotus, on Xenophon and the topography of Troy, his Comparative Geography of Western Asia, his services to African geography, including a remarkable elucidation of Mungo Park's discoveries, his Memoirs on the Ruins of Babylon, on St. Paul's ship-

wreck, and on the landing of Cæsar in Britain. Of the departments of scientific geography which engaged his attention, the chief was hydrography—then in its infancy—in connection with which he prepared a most valuable series of wind and current charts, which formed the foundation of all subsequent investigations. Major Rennell died on March 29, 1830, at the age of eighty-seven, and was buried in Westminster Abbey. In this volume, recalling attention to the work of a pioneer in English geography, Mr. Clements Markham has conferred a great boon on the geographical students of the present generation.

My Early Travels and Adventures in America and Asia. By Henry M. Stanley, D.C.L. 2 vols. (pp. xxi + 301 and ix + 424). London: Sampson Low, Marston, and Co., 1895. *Price* 12*s.* 6*d.*

Mr. Stanley's name is a sufficient warrant that this, in one sense his latest work, will be widely read and appreciated. It is only in one sense his latest work, because, as the title indicates, the two volumes relate to a period preceding the date of his first plunge into the "Dark Continent," the scene of his greatest achievements.

These two volumes differ from one another in a marked degree. The first is made up of a series of letters written in 1867 for the *Missouri Democrat* and another American newspaper, when Mr. Stanley accompanied the military expeditions of Generals Hancock and Sherman into the then unsettled territory of south-western Kansas and Nebraska. The second and larger volume begins with a description of the opening of the Suez Canal in 1869, and thereafter recounts Mr. Stanley's experiences in the course of a journey by Constantinople, the Black Sea, the Caucasus and Teheran, onward to the Persian Gulf. All this, as Mr. Marston points out in his *Publishers' Note*, 'may by some be regarded as ancient history'; and there can be no doubt that this will be the view taken by many readers of the work. It is an open question whether descriptions of this kind, written for the daily press, are deserving of a more permanent form, especially after the lapse of a quarter of a century. But, at any rate, the future biographer of Stanley will have no objection of this kind to urge, because the work in question will be of great value to him in helping him to complete the history of Stanley's life, and to show the effect of time and experience upon his style as a writer. Even in the two volumes themselves there is a noticeable difference in style, although the Eastern experiences are only two or three years subsequent to the account of the American-Indian campaigns. No doubt this is largely due to the fact that the one is little more than a record, by a very able newspaper reporter, of the doings of the United States Commissioners sent to treat with the Red Indians, whereas the other contains a great deal of historical and archæological information, displaying Mr. Stanley in what will be to many a new light. The volume devoted to his Asiatic experiences is unquestionably that which will appeal most strongly to European readers, of whom few will take an interest in the unimportant events detailed in the first volume; which, indeed, is not likely to attract a very great number of American readers.

Nevertheless, the American volume has a certain value of its own, if only because it shows the rapid advance of civilisation in the Great West. When Mr. Stanley accompanied the expeditions in 1867 the greater part of Kansas and Nebraska was an unsettled wilderness. And, even five years after the great council held at Medicine Lodge Creek, that region was still overrun with buffaloes, antelope, and other game, as the present reviewer can testify from personal experience. Nor was the Red Indian wanting in considerable force. But

a few years later all was changed. The country was crossed by railroads, the game and the Indians disappeared, "cities" sprang up every here and there, and the printing-press was busy on the very site where the Wasaji lodges had recently stood. Such transformations are not uncommon nowadays (as witness Buluwayo), but their frequency does not render them any the less wonderful.

Two photogravure portraits of Mr. Stanley are given; one from a photograph taken at Constantinople in 1869, the other showing him as he appeared in 1890, stamped with the impress of a life of daring and adventure. Each of the volumes has an excellent map, denoting the region traversed. We observe that the map prefixed to the second volume contains the author's route from Bushire to Bombay and thence to Zanzibar and Ujiji, whereas the narrative stops short at Bushire. Perhaps this is done to remind readers that the sequel to the Asiatic tour was the memorable and successful journey in search of Livingstone.

Lotos-Time in Japan. By Henry T. Finck. Illustrated. New York: Charles Scribner's Sons, 1895. Pp. xviii + 338. *Price* $1·75.

Mr. Finck spent a couple of months in Japan and has written a book about Japan and the Japanese. Many a globe-trotter has done that before. But Mr. Finck claims one special merit for himself, viz., to have shown "that the Japanese have as much to teach us as we have to teach them, and that what they can offer us is, on the whole, of a higher and nobler order than what we can offer them." The greater part of the book, which contains a description of the author's actual experience of travelling in Japan, will not, we fear, impress the reader much with the superiority of Japanese civilisation, Mr. Finck's stay having evidently been too short, and perhaps the reader will regret with us that our author did not live longer among the Japanese, for surely his style does not show much of the influence of "the æsthetic nation *par excellence*." The following is a fair specimen: "For, while the Japanese have never been cannibals, it must be confessed that the principal ingredients in their tea-house meals are tender young girls—pretty waiting maids to serve the dishes," etc. Readers who like this kind of writing will no doubt find the book very amusing. On the last 50 pages the superiority of Japanese culture is systematically set forth, and this part of the book shows that Mr. Finck has made good use of the principal treatises on Japan. Certainly, western nations, especially the author's own—the American—might learn from the Japanese on a good many points.

Venice. (*The Story of the Nations.*) By Alethea Wiel. Second (Tourist) Edition. London: T. Fisher Unwin, 1895. Pp. xxxiv + 478.

"In the world's stories there are many pages of interest and renown, but there are few which can boast of a splendour or a romance so absorbing and so wonderful as that which encircles the Story of Venice" (p. 464). Such, we may take it, is the justification of the appearance of a tourist edition in a series devoted to history. The justification is ample, for the story is full of incident and is here well presented, so that the tourist may readily combine pleasure with knowledge by reading this volume. The administrative institutions and intricacies of the republic are skilfully traced; commercial and external relations are not made unduly subordinate; the tendency to over-digression in the case of attractive incident is judiciously restrained. The illustrations are numerous and apt. The style is clear, but somewhat too free and hence on occasions hardly accurate.

Il Porto di Venezia. Di Lanzoni Primo, Professor nella R. Scuola Superiore di Commercio di Venezia. Verona e Padova : Fratelli Drucker, 1894. Pp. 48.

It is not surprising that, as the site of Venice owes its origin to the deposition of alluvium, the same cause should have threatened its existence as a maritime port by the silting up of the approaches from the Adriatic. In 1840 Pietro Paleocapa improved the port of Malamocco by the construction of a breakwater 2340 yards long on the eastern side, which, with another shorter one almost parallel to it, caused the water to scour out a channel navigable by large merchant vessels. But vessels entering by this opening have to make their way to Venice through winding channels for a distance of more than nine miles, and therefore the Venetians turned their attention to the nearer Porto di Lido. Two dykes, 3820 and 3120 feet long respectively, have now been constructed, with the result that there is now a navigable channel 22 to 24 feet deep

Signor Primo also describes the facilities for loading and discharging cargo, which have been provided during the last twenty or thirty years—the Stazione Marittima, its wharves and cranes and rails connecting it with the terminus of S. Lucia, the bonded and other warehouses on the Giudecca canal ; and treats of the railway communications with Italy and the adjoining countries. There are several useful plans and maps in the pamphlet.

Die Liparischen Inseln. Viertes Heft : *Panaria.* Prag : Druck und Verlag von Heinr. Mercy, 1895.

Panaria is the smallest of the Lipari group, having an area of not much more than a square mile. It has, however, the most attractive landscapes, and imposing masses of rocks are not altogether wanting, as may be seen from the excellent illustrations in this book. The view facing page 20 shows a group of very curious rocks composed of conglomerate and liparite.

Le Pétrole, l'Asphalte et le Bitume au point de vue géologique. Bibliothèque Scientifique Internationale, LXXXI. Par le Professor A. Jaccard. Paris : Félix Alcan, 1895. 8vo, pp. 292, with 30 figures in the text.

The mode of formation of natural hydrocarbons has given rise to an extensive literature, in which considerable difference of opinion in regard to the interpretation of the facts is expressed. Much of this appears to be due to the fact that almost every investigator in this line of inquiry seems to have made up his mind to discover one exclusive method by which all the occurrences of natural hydrocarbon may be explained, instead of taking into account the fact that in Nature identical results are often produced by various and often widely different causes. The author of the book under notice has approached his subject in a more rational way, and has evidently used his best endeavours to take into account every possible mode of origin of the mineral substance in question.

M. Jaccard was led to consider the origin of natural bituminoids while engaged in studying the well-known asphalt-bearing strata of the Val de Travers in the Jura. After extending his investigations upon the same subject in various other directions, and duly considering what had been previously written by others, he has produced the present work, which deals with a considerable number of facts and arguments directly bearing upon the subject of inquiry.

The earlier chapters of the book are devoted to a critical examination of some of the older theories relating to the origin of bituminoids. Then follows several chapters treating of the mode of occurrence of these compounds in various parts of the world. Chapter x. commences with some account of the exploitation of petroleum deposits, and concludes with observations upon the future prospects of

the industries connected with them. Lastly, the author gives a short summary of his own views on the subject, in which it is evident that he is disposed to regard most of the natural bituminoids as products arising from animal matter.

The book cannot fail to prove interesting reading to those who want to find out what is known regarding these interesting and commercially valuable deposits.

Blackie's Descriptive Geographical Manuals. By W. G. Baker, M.A. *No. IV. Europe* (with exception of the British Isles). London: Blackie and Son, Limited, 1895. Pp. 216. *Price* 2*s.*

Mr. Baker's Manuals of Descriptive Geography are constructed on excellent and rational principles. Their general aim is "to ensure the intelligent teaching of geography as distinguished from mere rote learning." The text consists for the most part of interesting descriptions of places and peoples, and of manners and customs, and includes vivid and suggestive extracts from well-known voyages and books of travel. Further, the descriptions are copiously illustrated with pictures, maps, and diagrams. By these means the scholar is brought into close contact with the characteristic features of the several countries and with the life of the people; his interest is quickened, and his intelligence is cultivated. The plan of the series is exceedingly good. The first volume treats of the Elements of Geography; the second, with the British Isles; the third, with the British Colonies and Dependencies; the fourth, with Europe; and the fifth, with Asia, Africa, America, and Australasia, exclusive of the British Possessions. Most of the pictorial illustrations are admirable, and the maps are generally clear and well executed.

The Scholar's Geography. Especially prepared for Elementary Schools. By J. S. Horn. Twelfth Edition. Manchester: John Heywood, n.d. Pp. 180. *Price* 1*s.*

As this is the twelfth edition of an Elementary Geography, it must have met with a good deal of favour. It is constructed on the old lines, but it seems well arranged for the purpose of learning. This edition is said to be "revised and corrected to the present time"; but as the book nowhere bears a date, the information is valueless. We notice that in the list of Scottish seaports it enters Aberdeen twice; and while it recognises Perth, Dumfries, and Irvine, it ignores Grangemouth, Ardrossan, Kirkcaldy, and Ayr.

Lessons in the New Geography, for Student and Teacher. By Spencer Trotter, M.D., Professor of Biology in Swarthmore College, Pennsylvania. Boston, U.S.: D. C. Heath and Co.; London: Isbister and Co., 1895. Pp. viii + 182.

In his exposition of "The New Geography," Dr. Spencer Trotter makes, in a scientific sense, somewhat of a false start. His first word is that "we live in a world of ideas"—that is, of "mental pictures of real things"; and he holds that the great aim of the teacher of geography should be to make these pictures "not only true, but *living* ideas of the things themselves." There is a certain unsatisfactory vagueness in the author's conception of "living ideas." He seems to understand by the words nothing more than ideas of living things, for he adds that the end of all study is to create "a fulness of interest in life, and in the lives of every man and woman." This view of study may satisfy the biologist, but it is more likely to puzzle the mere physiographer. Dr. Trotter goes on to say that as these "ideas," or "mental pictures," are the creatures of the imagination, the imagination is the only faculty to which the geographer or the teacher of geography needs to appeal. That is surely a very narrow conception of the teacher's work and method. He

says that imagination is "the one element needful in gaining the ideas of real things." Now, that geography appeals to the imagination, and that the power of that faculty ought to be utilised, every one will admit; but to say that it is "the one element needful" is very like nonsense. That must surely be a very inadequate treatment of geography as a study which appeals to the imagination solely, and not at all to the power of observation, the reasoning faculty, and the judgment. That is to put geography on a level with fairy tales. Now, fairy tales are interesting, and may be instructive; but they are not science. The old geography has many faults; but if "the new geography" is to eschew science, and to confine itself to the creating of "mental pictures," it will not be a great improvement on the old. In truth, however, Dr. Trotter's practice is better than his theory as conveyed in a rhetorical and rather high-flown style. His book contains much interesting and suggestive material, together with some that is of doubtful value. We do not find, indeed, that he wholly neglects the reasoning powers, or appeals solely to those of imagination, in, for example, his chapters on "Climate" and on "Commerce" and "Discovery." Of considerable value, also, are the sections on "Plants which have affected Man," and on "The Types of Man" and the geographical distribution of the different races, which contain a good deal besides "mental pictures" created by the imagination. The author's views regarding the original home of the white race are not quite up to date. He holds the opinion that the white man sprang from "somewhere in the Western Mediterranean region—South-western Europe and Northern Africa." According to this view, the civilisation of Greece and Rome must have come, not from the east, but from the west, and in that case the development of Rome must have preceded that of Greece, which is contrary to authentic history. But, in truth, the author's statements are self-contradictory; for, in one and the same paragraph, he says (p. 94) that "the Aryans had come from the *West*," and that "the main body of the Aryans began a slow *westward* movement back again, barred from further progress to the *East* by the great mountain wall of Central Asia," which is not quite intelligible. Dr. Trotter does not seem to know that the theory now generally accepted by ethnographers places the original home of the Aryans in the East of the Germanic plain in Europe, whence they diverged westward and southward. In these matters he is evidently not a trustworthy guide. The Appendix contains well-arranged tables, which may be turned to good account as synopses of study.

China. Imperial Maritime Customs. I. Statistical Series: No. 6. Decennial Reports on the Trade, Navigation, etc., of the Ports open to Foreign Commerce in China and Corea, 1882-91. Shanghai: at the Statistical Department of the Inspectorate-General of Customs. London: P. S. King and Son, 1893. Pp. xii + 694 and two Appendices. *Price* $8.

This bulky volume contains, besides a large collection of statistics more particularly relating to commerce, a considerable amount of information interesting to geographers and meteorologists. In commercial geography we find many full and instructive notes on the production of tea, opium, camphor and other native crops, their preparation and distribution. The condition of the harbours, means of communication, and the routes by which the various goods are carried from and into the interior are, of course, described in detail. The changes which have taken place in the treaty ports and the treaties under which they are open to foreign trade are also noticed.

The numerous maps and plans drawn or corrected by Mr. R. A. de Villard are particularly valuable, containing as they do details not be found in any other publication, and from a reliable source.

MAPS.

EUROPE.

ENGLAND AND WALES, Railway Map of ——, revised by the various Companies. Also showing Canals. *W. and A. K. Johnston, Edinburgh.*

The lines owned or worked by the various railway companies are distinguished by colours. Perhaps some improvement might be made by keeping apart shades of the same colour. Insets are given of the districts where the railways are most numerous, such as London, South Lancashire, and South Yorkshire.

SCHWEIZ. Bearbeitet von F. Handtke und A. Herrich. Massstab 1°: 600,000. *Verlag von Carl Flemming, Glogau.*

The map, originally compiled by F. Handtke, has been revised and brought up to date by A. Herrich. The details are clear and the names very numerous.

ASIA.

CHINESE EMPIRE, The ——, with the adjacent parts of Russia, India, Burma, etc. Scale: about 150 miles to the inch.

NORTH CHINA, Map of ——, Corea and part of Japan, showing the principal Cities, Routes, and Rivers from Shanghai to Moukden and Fusan. (Names both in Chinese and Roman characters.) Scale: about 46 miles to the inch.

UPPER CHILI AND GREAT WALL. (Names in Chinese characters.)

SHINGKING AND CHILI. (Names in Chinese characters.)

PORT-ARTHUR TO NEWCHWANG.

TIENTSIN TO PEKING, with Plans of Peking and Environs. (Chinese characters.)

COREA. Insets—Yuensan, Fusan, and Jenchuan, Seoul City and Environs. (Names in Chinese and Roman characters.)

FORMOSA. Insets—Environs of Tamsui, Kelung, Tainan, and Anping.
Compiled by R. A. de Villard.

SHANGHAI AND WUHU, Map of the Shooting Districts between ——, by H. T. Wade and R. A. de Villard.
Presented by R. A. de Villard, Inspectorate General of Customs, Shanghai.

AFRICA.

CHEMIN DE FER DU CONGO, Carte des 200 premiers kilomètres du ——. Échelle du 1 : 100,000^{e}. Dressée par A. J. Wauters.
Administration du "Mouvement Géographique," Bruxelles.

CHART.

SAN IGNACIO LAGOON, west coast of Lower California. From a survey in 1892 by the officers of the U.S.S. *Thetis*, Commander G. C. Reiter, U.S.N. commanding. No. 1494. *Hydrographic Office, Washington.*

THE SCOTTISH
GEOGRAPHICAL
MAGAZINE.

ADDRESS TO THE GEOGRAPHY SECTION OF THE BRITISH ASSOCIATION.

(Ipswich, 1895.)

By H. J. Mackinder, M.A., F.R.G.S.,

President of the Section.

This is a memorable year for English students of geography. We have entertained in London for the first time a great gathering of our foreign colleagues, and have presented to the British public the unfamiliar spectacle of a geographical meeting, in which scholars and professors were as prominent as explorers. As a nation we may justly claim that for several generations we have been foremost in the work of the pioneer; nor need we view with dissatisfaction our contributions to precise survey, to hydrography, to climatology, and to biogeography. It is rather on the synthetic and philosophical, and therefore on the educational, side of our subject that we fall so markedly below the foreign, and especially the German, standard, and it is for this reason that we may regard the Sixth International Congress as a noteworthy object-lesson for English geographers and teachers. The time seems, moreover, to have been ripe for some such stimulating influence. To indicate a few signs only of rising courage among our geographers, and of sympathy on the part of the public, I would draw your attention to the institution of afternoon meetings in Savile Row for the discussion of technical questions, to the success of the new *Geographical Journal*, notwithstanding its geographical as opposed to merely "adventuring" flavour, to the recent formation of a geographical association of Public Schoolmasters, and to the demand for addresses on the teaching of geography on the part of the local branches

of the Teachers' Guild. Facts are reminding us once more that the lapse of a certain time is essential to the rooting of a new idea, and we may thank the geographical veterans of 1869 for sowing seed the fruit of which we are now harvesting. That I am not alone in my interpretation of present tendencies is clear from the emphatic opinion of the President of the Royal Geographical Society expressed in his last annual address, that "the time is approaching for a reconsideration of the educational policy of the Society." It would almost seem that we are nearing a development of geographical education not unlike that which nine years ago followed on the publication of Mr. Keltie's valuable Report. At that time two of my predecessors in this chair, Sir Frederick Goldsmid and Sir Charles Warren, thought it not unfit to make education the chief theme of their addresses, and, encouraged by their example, I venture, under present circumstances, to call your attention once more to that subject. Since 1886 and 1887, however, much has happened, and we no longer need to discuss the more elementary teaching of geography. I propose, therefore, to treat of comparative and philosophical geography in relation especially to secondary and university education, and it seems to me that an historical rather than an *a priori* discussion gives the best promise of result.

The middle of the eighteenth century marks an important epoch in the history of geography. In ancient times Ptolemy and Strabo grasped the system and possibilities of our science, but they failed to build high from lack of a broad foundation of precisely recorded facts. Subsequently, geography had its Dark Ages and its Renascence in harmony with the general trend of human affairs. By the end of the sixteenth century Mercator and Ortelius had somewhat more than recovered the Greek position, but still, for another century and a half, geographers wrestled with essentially the same problems as had presented themselves to the ancients. The observers ascertained latitudes and longitudes with ever-increasing precision, the cartographers projected the observed positions on their maps with growing happiness of compromise, and the scholars sought, with the prodigious industry characteristic of the age, to identify the sites mentioned by the ancient authorities. Three names—Harrison, D'Anville, and Varenius—in the several fields of observation, cartography, and scholarship, may be taken as completing this stage of development, although, as is always the case, the new and the old overlapped. In 1761 the chronometer was added by Harrison to the magnetic compass, the log-line, the sextant, and the theodolite, and thus was completed the observer's equipment. In the same year D'Anville published his *Atlas Moderne*, in which (besides a fidelity of outline greater than that of his predecessors Delisle and Homann) he brought to bear a mechanical finish and a criticism of data that were new to cartography. Only a few years earlier, in 1755, there appeared in Paris a French translation of the *Geographia Generalis* of Varenius, first published at Amsterdam in 1650, edited for Cambridge in 1681 by Sir Isaac Newton, and reprinted again and again for three generations as the masterpiece of the "scholarly" geographers. Thus when George III. was still young, the *horizontal* outlines of the map of the world had taken their now familiar form, and

school geography consisted of "the use of the globes" with some small attention to classical topography.

What made the eighteenth century a transition age of such importance to geography was the realisation of new problems, which both Antiquity and the Renascence had either neglected or utterly failed to solve. These problems allow of most general expression by the use of three convenient terms, two of them lately imported from Germany—lithosphere, hydrosphere, and atmosphere—the first implying the rock globe whose surface is both land and sea-bed, the other two denoting the external envelopes. The geographer is concerned with the atmosphere, the hydrosphere, and the surface of the lithosphere. His first business is to define the *form*, or relief, of the surface of the *solid* sphere, and the *movements*, or circulation, within the two *fluid* spheres. The land-relief conditions the circulation, and this in turn gradually changes the land-relief. The circulation modifies climates, and these, together with the relief, constitute the environments of plants, animals, and men. Shorn of complexities, this is the main line of the geographical argument. In the language of Richthofen, the earth's surface and man are the terminal links. It is clear that all depends on the accuracy of the first premises—the form of the lithosphere and the movements within the hydrosphere and atmosphere. Before last century geographers ascertained the horizontal elements in form, but neglected the vertical. In the matter of outline, the maps of D'Anville are an immense improvement on those of Ortelius, but they exhibit essentially the same almost child-like methods for the depiction of relief which had been employed by Buckinck in the 1478 edition of Ptolemy. Until this was remedied the whole superstructure of comparative and philosophical geography lacked any real basis.

Like the letters of the alphabet, conventional hill-shading was evolved from pictures rather than invented. The great atlas of Germany, published at Nuremberg in 1753 by the successors of Homann, consisting as it does of maps engraved in various years extending from 1718 to 1753, shows admirably almost every stage in the evolution. Other striking evidence may be seen in the chart of New Zealand drawn from Captain Cook's surveys, and reproduced by Admiral Wharton in his edition of Cook's Journal. Side by side on the same chart, we have the "ant-hills" of Buckinck and Ortelius, and the "caterpillars" of modern maps; but the latter, like degenerate animals with rudimentary organs, still retain clear marks of their origin. The "ant-hills," elsewhere sown evenly over the land-surface, are in certain parts drawn into chains and foreshortened, or in modern railway parlance "telescoped." One step more—the confusion of the lines of slope-shading with those of hill-outline—and the pictures would be conventionalised, all signs of origin would be lost, and students who had never seen a great mountain-range would be led to think of it as a wall-like ridge. Even "ant-hills" are preferable to the "caterpillar" in its crudest form.

An indication of the importance attached to the new problem of relief is to be seen in the fact that, before the method of hill-shading or hatching had been perfected, the method of horizontal contouring

had already been invented. In 1737 Philip Buache, a French geographer of remarkably original mind, produced a contoured chart of the English Channel. Contour lines represent what would be coast lines were the sea to rise or fall to the level indicated, and it was natural that this device should first be applied to the mapping of the sea-bed rather than the land. In 1791 Dupain Triel drew a contoured map of France. But already in 1783, as Mr. Ravenstein pointed out in his address at the Cardiff meeting, Lehmann had combined the two systems, and, by superimposing hachures upon contours, and making the depth of shading proportional to the closeness of the contours, had produced a map which, while yielding to the popular requirements, rested on a scientific basis. Contoured maps, in which names are few or absent, can now, however, be made to rival in pictorial suggestiveness those which are shaded, and such maps are the more valuable in that they are not only structurally correct, but that they can be read also with accuracy and ease. Some of the sheets of the American Geological Survey may be cited as excellent examples of graphic effect produced by contours only.

Ptolemy's knowledge of the theory and methods of cartography far outran the positive materials at his command for the mapping of the known world. In the same way the methods of depicting relief, though so recently developed, already at the end of last century more than sufficed for the presentment of the recorded data. As was seen in the case of Ptolemy, there are peculiar dangers in the possession of an engine more powerful than is needed for the work in hand. In 1783 France was the only country in the world with a completed map based on systematic and detailed surveys. A relief-map like that of Dupain Triel was possible only in such a country. But in 1756 Philip Buache had already launched a general theory of relief resting on the conception of river basins, and had enriched geography with the terms "water-parting" and "plateau." In the absence of positive knowledge, what more natural than that cartographers should make illegitimate use of the theory of Buache, and should assume that in the coherent system of water-partings they had the orthographical skeleton of the world? Having drawn the courses of the rivers, they had only to run caterpillar-shading along the water-partings to produce a map, in parts accidentally true, which represented the land as uniformly composed of a series of flat pans. Such a method of map-drawing was advocated by Friedrich Schultz, in a paper published at Weimar as late as 1803, and is not rare in popular maps of much later date.

It is to Alexander von Humboldt that we owe the method still in use for giving a general, yet real, idea of the relief of a little-known country. Following, as he himself tells us, the precedent of the canal engineers, he constructed vertical sections along his routes through Spain and Mexico. It is worth noting in this connection that our knowledge of the relief of the sea-bed is mainly due to the requirements of another set of engineers—those engaged in laying telegraphic cables. Humboldt's sections were rendered possible by the daily use of the barometer and chronometer, and by Ramond's improvement of the formula for the reduction of barometric data. Before Humboldt, the barometer had been used for

the determination of isolated heights, but not for the traversing of a whole country.

Turning now to the other basis of scientific geography—a knowledge of the fluid circulation in the outer envelopes of the earth—we may regard the corner-stone of climatology as laid by George Hadley in 1735, in his well-known paper read before the Royal Society, "Concerning the Cause of the General Trade Winds." All that was done before his time was mere digging for the foundations; yet with rare thoroughness he enunciated, at one effort, the final theory, detecting the cause both of the movement equatorwards and of the westward swerving. We can point to no such crucial utterance in the sister field of oceanography, though it is said that, about the time of the American Revolution, Benjamin Franklin suggested that wind-pressure was the cause of the surface-currents of the sea. His idea was contained in a memoir on the Gulf Stream, which was suppressed by him lest it should fall into the hands of the English, and be of use to their ships in crossing the Atlantic. Major Rennell also, who, by his map of India and his Herodotean identifications, presents a likeness to the best of the old school of geographers, showed his participation in the new by compiling an Atlantic current-chart. But Humboldt's invention of isotherms in 1817 first gave to climatology cartographic resources, and rendered easy and precise the correlation of climate with relief. The idea was soon applied in other departments of geography—to the expression of atmospheric pressure, of the temperature of the sea-surface, of density of population, and indeed to any similar masses of data, capable, so far as time is concerned, of reduction to averages, but varying locally. The last edition of Berghaus's *Physical Atlas* is, in this matter, a monument to the memory of Humboldt: yet it is strange, that a method first suggested, in the seventeenth century, by the magnetic lines of the Englishman Halley, should have been left to fructify in the mind of a German of the nineteenth century.

The facts of geography are obviously capable of two kinds of treatment. The chapter-headings may be such as "Rivers," "Mountains," "Cities," or such as "Ireland," "Italy," "Australia." In other words, we may consider the phenomena of a given type in all parts of the globe, or we may discuss in a given part of the globe the phenomena of all types. In the former case, our book should *as a whole* observe the order of what has been called the geographical argument; in the latter case each chapter, the discussion of each country, should exhibit that order complete. For historical reasons, which will be referred to later, we English have fallen into a bad habit of describing the former treatment as "physical geography," and the latter as "geography." The Germans are more reasonable when they contrast *Allgemeine Erdkunde* with *Länderkunde*, but chorography, our nearest English equivalent to *Länderkunde*, is a clumsy expression. An alternative would be to speak of "special geography," thereby implying a correlative to "general geography," which is a precise rendering of *Allgemeine Erdkunde*. By whatever name we call it, however, it is clear that the treatment by regions is a more thorough test of the logic of the geographical argument than is the

treatment by types of phenomena. Hence Humboldt's *Essai politique sur la Nouvelle-Espagne*, published in 1809, must take high rank among the efforts of a new geography as the first complete description of a land with the aid of the modern methods. Here, for the first time, we have an exhaustive attempt to relate causally relief, climate, vegetation, fauna, and the various human activities.

The services of Humboldt to our science were so great that he almost merits the title of a new founder, and yet, of late, it has been the custom to decry him. It is probable that his memory has suffered a little from the less original work of his old age, for the Humboldt who devised cross-sections and isotherms, and wrote the *Essai politique*, was divided by the distance of a whole generation from him who was responsible for the *Asien* and the *Kosmos*.

We come now to the central event in the history of modern geography. It was in the year 1820 that Karl Ritter was called to Berlin to act in the double capacity of Professor in the Military School and Professor Extraordinary in the University. Born in 1779, ten years after Humboldt, Ritter's early training and circumstances were such as admirably to fit him for the great position he was to occupy during the last thirty-nine years of his life. His schooling was at Schnepfenthal, under Salzmann, a well-known educational experimenter of the following of Rousseau. Later in life Ritter learnt to know and to love the classics, but Salzmann's hostility to them as an educational implement secured for his pupil freedom from the current intellectual moulding. The peculiar opportunities of his subsequent position as tutor in the Hollweg family almost amounted to an endowment for research, and it was then that he accumulated that vast miscellaneous knowledge so valuable to the intellectual pioneer. It is not unimportant in connection with Ritter's later theories to observe that, at this time, Cuvier and Franz Bopp were applying the comparative method to anatomy and philology. Nor did he fail to cultivate that half artistic perception of land-forms, the early exercise of which seems to be to the geographer what youthful training in pronunciation is to the linguist. While travelling with the young Hollwegs, he caused astonishment in Switzerland by the accuracy of his delineation of a mountain range. Add, that fortune brought Humboldt and Pestalozzi across his path, and we understand the influences which shaped Karl Ritter into the greatest modern professor of geography.

Ritter produced both books and men. He had the personal charm of the born teacher, and the Prussian officers of 1866 and 1870 were as truly his intellectual offspring as was the *Erdkunde*, of which Schlegel said that it was the Bible of Geography. Nor did his classes fail to bring forth professed geographers, such as Guthe, and historians with the geographical eye, such as Curtius. But Ritter did not stand alone. He was one of a group of four men, who together made the geography of the nineteenth century as distinctively a German science as that of the eighteenth century had been French. One is almost tempted to draw a comparison, man for man, between Humboldt, Ritter, Berghaus, and Perthes, and that great group of later Germans—Bismarck, Moltke, Von

Roon, and William I. The coincidence is not quite so fortuitous as might at first sight appear; for Berghaus, the cartographer, and Perthes, the capitalist employer of cartographers, were as necessary to the earlier combination as, to the later, were Von Roon, the organiser, and William, the kingly employer of statesmen and generals.

In 1827 Humboldt, who, on his mother's side, was French by descent, left Paris, which had been his home for nearly twenty years, to join the Prussian Court at Berlin. In the winter of 1827-28 he gave a course of brilliant lectures before the University, in which was contained the nucleus of the subsequent *Kosmos*. In 1829, at the invitation of the Russian Government, he spent twenty-five weeks on a rapid journey to the mines of the Ural and Altai, and received the impressions which led to the *Asien*. Thence onward Humboldt and Ritter lived at Berlin, mutually appreciative, and complementing each other in mental characteristics. They died in the same year, 1859, just before those great political events which changed the whole aspect of German life.

The influence of the new school was early felt beyond Germany. Petermann, the pupil of Berghaus, came to our islands to help Keith Johnston with the English edition of Berghaus's great *Physical Atlas*, whilst Arnold Guyot, the Swiss disciple of Ritter, after teaching for a time at Neuchâtel, crossed the Atlantic to lecture at Harvard, and afterwards to accept a chair at Princeton.

No sooner, however, were the two great masters at Berlin dead, than German geography passed into a new phase, a phase of which the typical representative was Oscar Peschel, the critic of both Humboldt and Ritter. The facts of Peschel's life are soon told. He began as a journalist, he became a geographical writer, and died a professor of geography. From 1849 to 1854 he was assistant editor of the Augsburg *Allgemeine Zeitung*. Then, until 1870, he was sole editor of the weekly *Ausland*. From 1871, until his death in 1875, he occupied a chair in Leipzig University. The titles of his books may serve as an index to his mind. The *Age of the Discoveries* appeared in 1858, and the *History of Geography* in 1865. He then turned his attention to physical questions, and produced in 1870 his striking *New Problems for Comparative Geography*. Finally, in 1874, came the *Völkerkunde*, a title not easily translatable into English. After his death his pupils, acting apparently under the inspiration of Professor Kirchhoff of Halle, collected his essays and lectures, which were published in a series of volumes edited with varying degrees of merit.

Peschel's criticism of Humboldt was of the rarest kind. He appreciated the good, detected the errors, and, above all, suggested the remedies. Humboldt's later works, the *Asien* and the *Kosmos*, both exhibit striking excellencies, and for a time enjoyed great vogue, yet both, like Newton's *Optics*, helped to delay the advance of science. How this happened will be manifest if we reflect that general or physical geography is the basis, not only of special geography, but also of geology; and that just when Humboldt was vitiating his description of Asia with Élie de Beaumont's speculations on the origin of mountains, and was conveying the impression that general geography was equivalent to the entirety of natural science,

Lyell was shaping physical geography to the ends of the geologist, and making it a key to unlock the past. The result, so far as geography is concerned, may be seen at the present day in the time-table of many an English girls' school. Separate hours are set apart for "physical geography" and for "geography." The one is studied with a text-book written from the geological standpoint, the other in a manual of mere names lit up occasionally with a few ideas drawn from Ritter or Strabo. Thus it was that geography was divorced from physical geography to be unequally yoked with history. Peschel restored physical geography to the geographer, and made it the implement of analysis in the field of *Länderkunde*.

But while the geographers had gone astray in the wake of Humboldt, the geologists neglected that great chapter of their subject which they hold to-day in common with the geographers. Stratigraphy, palæontology, and mineralogy claimed their first attention, and it was only after a time that Ramsay and Geikie among the English geologists, and Dana among the Americans, began to study what we now call geomorphology—the causal description of the earth's present relief. It was Peschel who asserted the claim of geography to include geomorphology, and so rendered possible a genetic, as opposed to a merely conventional, classification of the features of relief. Though common to both studies, it plays a different part in each. The geologist looks at the present that he may interpret the past; the geographer looks at the past that he may interpret the present. The geographer's argument begins, as we have said, with the surface of the earth, but to his almost artistic perception of land-forms he must add a causal analysis; precisely as the artist learns anatomy the better to grasp the human outlines.

Peschel's criticism of Ritter is less happy than that which he gave to Humboldt. He complains of Ritter's use of the expression "Comparative Geography,"and substitutes another of his own. As a matter of fact, all geography which is not merely descriptive must be comparative, and the various uses of the term made by different writers are but particular cases of one of the most general ideas in scientific method. Varenius called all geography comparative that was not mathematical or astronomical. Ritter compared peoples with the lands they inhabited, in order to establish the influence of environment. Peschel compared one physical feature with another, with the object of discovering their origin. Markham uses comparative geography to imply a comparison of historical records, with a view to showing the changing aspects of the same locality at different times. Peschel's difference with Ritter is, in this matter, a merely verbal quibble. Nor can we say much more with reference to his obvious dislike of Ritter's teleological views, which, though they colour every statement he makes, yet do not affect the essence; it is easy to restate each proposition in the most modern evolutionary terms. Where, however, Peschel questions the adequacy of particular correlations of peoples and environments, it must be admitted that he usually strikes between the joints, and this is still more evident when he has to deal with Ritter's daring follower, Buckle. The truth of the matter is, that Ritter and Buckle had taken for their field the highest and most difficult

chapter in geography, and that they underrated the complexity of the problems with which they had to deal. We are all familiar with the saying that it required the Greeks in Greece to develop the Athenian civilisation, and that neither the Greeks elsewhere, nor any other race in Greece, would have been equal to the achievement. It would be easy for a Peschel to demonstrate the falsity of an assertion that the Greeks owed all to Greece, but, on the other hand, the Ritters and Buckles were in error in attempting so simple an explanation. What seems to have been constantly omitted from these speculations is the fact that communities can move from one environment to another; that even a given environment alters from generation to generation; and that an existing community is often the product of two or more communities in past generations, each of them subject to a different environment. Now, the influences affecting a community at a given time may be resolved into dynamic and genetic. Among the dynamic influences, geographical environment is admittedly important. But the genetic influences are the momentum from the past, and the genetic influences acting on this generation may be resolved into the dynamic and genetic of the last. If this process be repeated through many generations, it is clear that the sum-total of geographical influence is always accumulating. The Normans, for instance, were exposed to successive environments in Norway and in Normandy, and much that was out of place in Normandy was due to the earlier action of Norway. The American, again, has characteristics and institutions which could hardly have been cradled in the Mississippi plain, but are explainable by a reference to the peninsulas and islands of Europe. A very striking instance of the errors involved both in Ritter's methods and Peschel's criticism is to be found in the case of China. Peschel assumes that the Chinese civilisation grew up in China, and asserts that a land of so massive outline was not fitted to stimulate such a growth. But the most modern research tends to show that the Chinese were not thus isolated in early times, and that Chinese civilisation was of Western, not home, origin. Ritter erred in thinking the action simple and uniform, Peschel in underestimating its cumulative influence.

Since the war of 1870, geographical chairs have been multiplied throughout Europe, and especially in Germany, and at the present time German-speaking geographers form a little public of themselves. Some of the Professors, as Richthofen of Berlin and Penck of Vienna, have worked mainly at geomorphology; others, such as Krümmel of Kiel, at oceanography; others, again, such as Ratzel of Leipzig, at anthropogeography; while Wagner of Göttingen has been conspicuous in cartography, and Kirchhoff of Halle and Lehmann of Münster in questions of method. Davis of Harvard and Woeikof of St. Petersburg may count as foreign adherents of the German school. There can be no doubt that it is especially in geomorphology that the advance has been most rapid, and here we may trace Peschel's impulse still unexhausted. In 1887, Gerland of Strasburg went so far as wholly to exclude the human element from geography, and to make it a purely physical science. He probably represents the extreme swing of the pendulum. There is evidence now

of a reaction towards Ritter, and as Wagner has pointed out, we owe to Gerland himself the admirable series of maps in the new edition of Berghaus's *Atlas*, which deals with man, and brings out with startling clearness the interdependence of relief, climate, and population.

Let us now sum up the problems and methods of modern geography as they have resulted from the last five generations of work and criticism. Merely verbal definitions may be left to the dialectician, but there are two different modes of giving practical definition to a department of knowledge. It may be considered either as a discipline, or as a field of research. As a discipline, a subject requires rough definition for the purposes of organisation. It should exhibit a central idea or a consistent chain of argument. On the other hand, no theoretical considerations can hold the investigator within set bounds, though he is none the less practically limited by the nature of the arts of investigation to which he has served his apprenticeship. The chemist should manipulate the blowpipe, the physicist should be an expert mathematician, the historian should be skilful as a palæographer, and familiar with mediæval Latin. That subject is most legitimate which admits of either definition, which exhibits both a consistent argument and also characteristic arts. The researcher will then be the writer of the text-book, and while research is fertilised by suggestions born of teaching, teaching will be illuminated by the certainty within uncertainty which comes of first-hand touch with facts. Geography satisfies both requirements; it has arts and an argument.

There are three correlated arts (all concerned chiefly with maps) which may be said to characterise geography—observation, cartography, and teaching. The observer obtains the material for the maps, which are constructed by the cartographer and interpreted by the teacher. It is almost needless to say that the map is here thought of as a subtle instrument of expression applicable to many orders of facts, and not the mere depository of names which still does duty in some of the most costly English atlases. Speaking generally, and apart from exceptions, we have had in England good observers, poor cartographers, and teachers perhaps a shade worse than cartographers. As a result, no small part of the raw material of geography is English, while the expression and interpretation are German.

The geographical argument has already been sketched. The first chapter deals with geomorphology—the half artistic, half genetic consideration of the form of the lithosphere. The second chapter might be entitled geophysiology; it postulates a knowledge of geomorphology, and may be divided into two sections—oceanography and climatology. At the head of the third and last chapter, is the word "biogeography," the geography of organic communities and their environments. It has three sections—phytogeography, or the geography of plants; zoogeography, or the geography of animals; and anthropogeography, or the geography of men. This chapter postulates all that has preceded, and within the chapter itself each later section presupposes whatever has gone before. To each later section and chapter there is an appendix, dealing with the reaction of the newly-introduced element on the elements which have been considered earlier. Finally, there is a supplement to the whole

volume, devoted to the history of geography, or the development of geographical concepts and nomenclature.

The anthropogeographer is in some sense the most typical and complete of geographers. His special department requires a knowledge of all the other departments. He must study geomorphology without becoming a geologist, geophysiology without becoming a physicist, biogeography without becoming a biologist. It has been recognised ever since the time of Strabo, that geography culminates in the human element, but the difficulties in the way of precise thought in this branch of the subject are such that, while its claims have been constantly reasserted, the other branches have hitherto made greater progress. At all times each race exhibits a great variety of initiative, the product, in the main, of its past history. In each age certain elements of this initiative are selected for success, chiefly by geographical conditions. Sometimes human genius seems to set geographical limitations at defiance, and to introduce an incalculable element into every problem of anthropogeography. Yet, as we extend our survey over wider periods, the significance even of the most vigorous initiative is seen to diminish. Temporary effects contrary to Nature may be within human possibilities, but in the long-run Nature reasserts her supremacy. Celt, Roman, and Teuton, successively neglected the Alpine and Pyrenean frontiers, but modern history has vindicated their power. Probably, when it is fully recognised that the methods of anthropogeography are essentially the same as those of physical geography, advance will become more rapid. The facts of human geography, like those of all other geography, are the resultant for the moment of the conflict of two elements, the dynamic and the genetic. Geographical advantages of past times permitted a distribution and a movement of men which, by inertia, still tend to maintain themselves even in the face of new geographical disadvantages. Economic, or commercial geography, should probably be regarded as the basal division of the treatment. The streams of commodities over the face of the earth, considered as an element of human environments, present many analogies to the currents of the ocean or the winds of the air. Strategical opportunities, also, have a constant action on communities, in the shape of tempting or threatening possibilities. Political geography becomes reasonable when the facts are regarded as the resultant in large measure of genetic or historical elements, and of such dynamic elements as the economic and strategic.

This being our conception of geography, it seems not without interest to sketch our ideal geographer. He is a man of trained imagination, more especially with the power of visualising forms and movements in space of three dimensions—a power difficult of attainment, if we are to judge by the frequent use of telluria and models. He has an artistic appreciation of land forms, obtained, most probably, by pencil study in the field; he is able to depict such forms on the map, and to read them when depicted by others, as a musician can hear music when his eyes read a silent score; he can visualise the play and the conflict of the fluids over and around the solid forms; he can analyse an environment, the local resultant of world-wide systems; he can picture the movements of communities driven by their past history, stopped and diverted by the

solid forms, conditioned in a thousand ways by the fluid circulations, acting and reacting on the communities around; he can even visualise the movement of ideas and of words as they are carried along the lines of least resistance. In his cartographic art he possesses an instrument of thought of no mean power. It may or may not be that we can think without words, but certain it is that maps can save the mind an infinitude of words. A map may convey at one glance a whole series of generalisations, and the comparison of two or more maps of the same region, showing severally rainfall, soil, relief, density of population, and other such data, will not only bring out causal relations, but also reveal errors of record; for maps may be both suggestive and critical. With his visualising imagination and his facile hand, our ideal geographer is well equipped, whether he devote himself to a branch of geography or to other fields of energy. As a cartographer, he would produce scholarly and graphic maps; as a teacher he would make maps speak; as a historian or biologist he would insist on the independent study of environment, instead of accepting the mere *obiter dicta* of the introductory chapters of histories and text-books; and as a merchant, soldier, or politician, he would exhibit trained grasp and initiative when dealing with practical space-problems on the earth's surface. There are many Englishmen who possess naturally these or compensating powers, but England would be richer if more of such men, and others besides, had a real geographical training.

Let us consider for a moment the methods of organisation by which the German results have been produced. There are two systems of examination important to geography—the philosophical doctorate of the Universities, and the *facultas docendi* of the State. Candidates for the doctorate present three subjects, one major and two minor, selected according to the taste or requirements of the student. Young geographers usually present themselves in geography as major, and in history and geology as minor subjects. The State examination for the *facultas docendi* is of greater severity and of more general effect, in that every secondary teacher must hold the Government qualification in the subject he teaches. As long ago as the time of Mr. Keltie's report, a single professor, Wagner of Göttingen, had examined in geography 200 candidates for the *facultas docendi*. It is a consequence of this system that at the last meeting of the *Deutscher Geographentag* there was an attendance of 500 members, *mostly specialist teachers of geography*; and, as a further consequence, there is a market for good maps in the German-speaking lands, whereas in England, reformers are constantly daunted by the fact that the public actually *prefers* the bad to the good. English specialists are almost invariably compelled to use German maps.

In most German universities there is now a Geographical Institute, possessed of lecture-rooms and work-rooms, with appliances and collections; and the teaching combines lecture, seminar, cartographical exercise, written thesis, and field practice. At Vienna, for instance, there are two professors of geography in joint charge of an institute founded in 1885. The institute has a yearly subvention from the State, and in 1891 had a library of 2400 volumes, the necessary globes and telluria, and an equipment of instruments for observation and cartography, besides 131 wall

maps, 27 relief models, 135 diagrams, 370 typical views (*Character-Bilder*), 1200 photographs, 148 bound atlases, and about 5000 separate maps. There were also a collection of rock-specimens, used more especially to convey the necessary geological ideas to the *Historiker* (who form a majority of the students), and a series of typical school-books and school atlases for the benefit of teachers. Professor Penck remarks that the neighbourhood of Vienna is in itself an admirable laboratory for every department of geography. It should be carefully noted that the University Institutes compete neither with geographical societies nor with public libraries, in that books and specimens of rare or unique character are excluded from the collections, which are solely for the use of the students of the institute.

In England geography has no appreciable position in degree-examinations; there are no examinations at all for the post of secondary teacher, nor is there anywhere in the land anything really comparable to the German Geographical Institute. Since 1869 the Royal Geographical Society has made repeated efforts to alter the situation, and it would be an error not to recognise that we are on the upward gradient. The Society's policy has been embodied chiefly in four measures—the offer of medals to the great public schools; the appointment of an inspector to report on foreign geographical teaching; the foundation of lecturerships in the universities, and the institution of a system of training for explorers. After sixteen years of trial the medals were discontinued on the ground that they affected only a few schools, and even in those schools only a few pupils. Out of a total of 62 medals awarded, no fewer than 30 fell to two schools; a noteworthy fact, as indicating at once the power and the rarity of skilled and enthusiastic geographical teaching. The most significant result of Mr. Keltie's report, and of the exhibition of specimens collected by him and now deposited with the Teachers' Guild in Gower Street, has been a general improvement in school text-books and maps, as seen particularly in some of the better elementary schools and training colleges. The university lecturerships have been effective only at Oxford for a sufficient time to judge of results. There, a considerable class of historical students attend lectures in geography twice a week, but are not likely to give the time necessary for more thorough study without the stimulus of examination. None the less, students who have heard lectures are gradually spreading geographical ideas, and the mere existence of the lecturerships is a valuable admission that the study is one of University rank. The classes for explorers have been conspicuously successful, and are probably the best of their kind in the world. But here we are dealing with those arts of observation in which, as already remarked, Englishmen excel.

With the example of Germany before us, with partial success to encourage us, with the interest aroused by the recent Geographical Congress to aid us, and with the reorganisation of secondary teaching impending, is not this the ripe opportunity for another, and it may be final effort, to make geography effective in English education? I do not deny that there may be several good roads to success, but I cannot help feeling that our most immediate need is a certain amount of centralisation. This is so for two reasons. First, because we English geographers

require, above all things, a tradition. We vary so widely in our views, and our examiners examine so differently, that teachers are at a loss whether to keep to the old methods or venture on the new. The old classical education still maintains its supremacy, mainly because through strong tradition it is workable without artificial syllabus; it is an organism rather than a machine. German geography, despite its modern growth, has a tradition, for Germans are all sons in geography of the ancestral group—Humboldt, Ritter, Berghaus, and Perthes. Secondly, we need a worthy object-lesson, which is attainable under existing circumstances only by the concentration of funds, and by the co-operation of several leaders. For no single lecturer, such as the Universities at present maintain, can deal adequately with all aspects of geography. An historical or classical student listens to a dozen different teachers at Oxford or Cambridge. Berlin and Vienna have each of them two professors of geography, besides *Docenten*. Moreover, a German student may pass from university to university, and thus correct the limitations of his teachers. Yet nothing short of a considerable object-lesson in England will bring general conviction as to the value and possibilities of geography. Nor need we fear that when centralisation has done its work, independent and local initiative will not vary the general tradition. Furthermore, the centralisation should not be complete. The work in progress at the Universities must not be abandoned. It will steadily gain importance in proportion as the central body does the work for which it is designed.

Clearly, if the policy of centralisation be agreed to, there is only one site for the central school. It must be in London, under the immediate inspiration of that Royal Geographical Society, whose past services to the cause would be a guarantee of support during the early efforts. But geographers must associate with themselves experts in education, if they are to avoid certain rocks which have knocked many a hole into the geographical projects of the past, and if public bodies and private individuals are to be moved to financial generosity. The beginning might be on a relatively small scale, but must not be too small for completeness. Theory, both on the scientific and historical sides, must be represented, and each of the three geographical arts. As regards observation nothing better could be asked than association with the admirable classes already existing. Cartography would be needed not only to supply the English map trade with an occasional Petermann, but especially that all serious students of the school might learn the ways of the geographical workshop. Teaching would naturally be associated with the various secondary and elementary training colleges. A certain number of university men might be tempted by the offer of a diploma to interpose a geographical year between the university and the master's desk; for headmasters would probably be only too glad to give the teaching of geography into the hands of specialists, provided these were men of university culture, able to be of general service in school-work, and provided also there was adequate guarantee that they were experts. There would, in addition, be a system of evening classes for teachers and clerks, and thus, while the school would render obvious and direct service to six millions of people, the staff would gain strength from the sense of

a generally diffused trust in them. The school would in no way duplicate the Geographical Society, while its staff would contribute an element of trained experts to the newly established afternoon meetings.

I launch this scheme, not with any fixed idea on the subject, for I would willingly abandon it in favour of another shown to be better, but because I am convinced that now is a great opportunity, and that a definite plan, even if it should prove unworkable, is more likely to provoke discussion and to produce result than mere negative criticism, which has often been anticipated. As effects of any adequate scheme, I should hope that, in a few years' time, geographical examinations would consistently test not merely memory for small detail, but clearness of apprehension, breadth of view, and power of statement, whether in word or map; that teachers would have the knowledge needed for Socratic rather than dogmatic teaching, and that students of geography would exercise the powers of analysis and composition, and not merely observe and remember. Geography would then be a subject rather for the higher than the lower parts of schools, and with the aid of a shelf of the classics of travel, sixth-form boys would write geographical essays with rapid but accurate map illustration. Then, the universities would receive freshmen who, whether candidates for historical or scientific honours, could express themselves resourcefully in map and diagram, as well as in language and writing. I speak from experience when I say that not one undergraduate in thirty has the necessary equipment for accurate appreciation of space-relations in history, as well as time-relations. In an age of inevitable but unfortunate specialisation the organising of another correlating study should not be unwelcome.

Once more, let us emphasise the fact that geography is not the science of all things. It has been the aim of this address to bring out the specific character of geography and of the geographer. Nor is it the only important subject in education. Its devotees frequently do it harm by excessive claims. Moreover, let us admit that as geography is now too often taught, and even as it is conceived of in some circles which pass for geographical, it merits no greater mercy than it receives at the hands of educationalists. Nor let it be denied that some facts that we would see taught as geographical are already dealt with in other, and, as we think, less advantageous connections. Lastly, let us beware of extolling the German example, which happens to be good in geography, to the degree of imputing inferiority to the whole system of English education. Let us do full justice to the position of our opponents, let us humbly benefit by their criticism, and then claim soberly, but with persistence, that a worthy geography is no pariah among intellectual disciplines. Amid the changes of organisation which are imminent, let us steadily maintain that the geographical is a distinct standpoint from which to view, to analyse, and to group the facts of existence, and as such entitled to rank with the theological or philosophical, the linguistic, the mathematical, the physical, and the historical standpoints. No intellectual education is complete which does not offer some real insight from each of these positions.

AFRICA AS A FIELD FOR COLONIAL ENTERPRISE.

By G. F. Scott Elliot, M.A., F.L.S., F.R.G.S.

In my recent journey to Ruwenzori, I may be fairly said to have sampled all the climates of our colonies in East and British Central Africa. I have for the last ten years made a pretty thorough study of African botany, and I may, I think, claim to have an opinion on the future of these magnificent possessions.

The first point on which it is necessary to be perfectly clear is the sense in which Europeans can colonise in Africa. There are two utterly different ways in which a foreign and new country may be exploited. These may be called the Indian and Australian methods.

They are constantly confused even by those who enjoy great African reputations,—but they are absolutely distinct. A second Australia can be formed in Africa only in places in which Europeans can maintain full bodily health and vigour, places to which they can bring their wives and children, and in which they can, if the necessity arises, work with their own hands. Any parts of Africa in which residence is only possible for a small number of years, after which it is essential for the European to return home, are on a very different footing. They are certainly valuable, but are infinitely inferior to the first group, which form a literal expansion of England.

Hence it is at once seen that the most important question is that of climate. Now, it is possible that there are portions of Tropical Africa in which a European can maintain full energy and health.

Taking Sir John Kirk's level of 5000 feet (I had quite independently worked out this question before I heard his paper, but had adopted 4000 feet), and looking at a recent map of Tropical Africa, one sees that a considerable amount of the continent *does* lie above this level. Starting at Ruwenzori, and proceeding southwards, keeping to the east of Tanganika, there is a central ridge of high land which divides the waters of the Congo on the west from those of the Nile, and from the Rovuma and other rivers which flow eastwards to the Indian Ocean. Part of the Stevenson road (between Tanganika and Nyassa) lies above this altitude. Besides this central ridge of high land, which is at one place interrupted by the Malagarasi river, there is a large extent of country in East Africa (the Masai Highlands, Kikuyu, and part of Ukambani) which is also above this altitude.

This "colony zone" is scarcely represented at all in West Tropical Africa, and the whole of the Uganda or Victoria plateau is not included in it.

The isolated mountain summits, such as Kilimanjaro, Kenia, Elgon, Ruwenzori, Abyssinia (parts of), Mfumbiro, and Mlanji, of course possess on their flanks a colonisable strip between 5000 and 7000 feet. Above this level the conditions are totally different.

The leading climatic features of the "colony zone" are a fairly dry air and a certain amount of cold at night. Above 7000 feet one

finds, on the contrary, an extremely wet climate, which is cold and miserable to a degree. Moreover it is doubtful, from my experience of mountain sickness, whether a settled residence would be possible at such high altitudes. At any rate, people who lived above 7000 feet would be exceedingly uncomfortable, and would be obliged to become "children of the mist."

As for that part of Africa which lies below 5000 feet, one can distinguish at any rate two different regions—that which lies below 3000 feet, and that which is between this altitude and 5000 feet.

The part below 3000 feet may be at once dismissed from consideration as not of the least importance. There is, fortunately, in our territory very little of this low-lying country, which is invariably unhealthy, and can only be developed at enormous expense in money and life.

That portion which lies between 3000 and 5000 feet has great prospective value, and it contains the only part of British Tropical Africa in which a serious beginning has been made. It includes the Shiré Highlands and a large part of British Central Africa, while in East Africa the whole of the Victoria region falls within it. The part of East Africa above 3000 feet which is on the seaward side is of no importance, for half probably belongs to the "colony zone," and half is the hopelessly dry, thorn-tree desert of Taru.

This middle or "coffee zone" must be taken as less valuable than the colonisable portion. It can only be considered as a kind of inferior India. People may go to settle there for five years at a time, but they will then require a holiday. On the whole, they may spend perhaps twenty to twenty-five years in Tropical Africa, and then retire on the fruits of their labour.

It is necessary to consider these different climates in detail, and their prospective value in the future.

The wet humid country below 3000 feet, which I propose to call the "palm-oil zone," is of little importance, being, in a natural state, either a dense and humid forest or miasmal swamps. It is very hot and intensely wet; and, owing to the rapid growth and as rapid decay of vegetable matter, the soil is exceedingly rich. All kinds of plants, and particularly food plants, bear profusely. This is really a provision of nature, for the wet and hot climate produces in man an enervated and feeble condition of body and mind, and if it were not for the abundant yield of food plants without the necessity of severe labour, man would become extinct. I have had the misfortune to spend six months in West Africa, and have travelled down Tanganika, and also Nyassa and the Zambesi, so that I have some practical experience of the climate. What happens is simply this. Certain wealthy mercantile firms, very few in number, establish factories or trading centres on the coast, to which a constant supply of young men is sent out. Probably nine out of twelve die during the first year, while the rest keep on during a period of from one to fourteen years, by which time the last survivor goes home a "West Coast cripple," shattered in constitution, and incapable of any work.

It is all very well to say that a large proportion of these wrecks are due to rum and evil habits; but imagine any average boy of nineteen

placed by himself in a place where the mere exertion of raising his hand causes profuse perspiration, subjected to frequent fevers and the resulting despondency, and where he sees the steamer once a month, and has between its visits scarcely any work and absolutely no amusements. What will an average boy do under these circumstances?

There are one or two cases[1] in which persons have been known to have spent twenty years without fever. If a man devotes his whole time and thinking power to looking after himself, he runs less risk; but how much work can he do? Such cases represent the exceptional survivor out of, perhaps, 3000 men.

The benefit to this country only accrues in two ways:—(1st) the money made enriches the Liverpool merchant or the Royal Niger Company, who, by spending it, benefit Great Britain—it is very rarely indeed that the man who has lived on the West Coast receives any benefit; (2nd) the system also diminishes the population of Great Britain.

Those who speak, as a certain eminent authority has lately done, of colonising the Congo, take a terrible responsibility. No one should know better than Mr. Stanley how deadly is the climate of that region.

I mention all this simply to explain my view that these poisonous places should be given to France, Germany, or Portugal, in exchange for some healthier region.

Two of the most valuable lives for the development of Africa have been recently risked by our Government for the sake of West Africa—I refer to Captain Lugard and Sir John Kirk—and this appears to me to be extremely inadvisable.

The more important products possible in such places are palm-oil, cocoa-nut, cotton, cocoa, sugar, beniseed, etc.[2] In the Zambesi valley (on the Nyassa and Shiré alluvial plains) all these products are worth trying. Sugar has proved a success on the Zambesi, but there has not been to my knowledge any thorough experiment with the others mentioned. Of these, cotton appears to me the most promising, and it is quite possible that a cotton mill could be started, perhaps at the Shiré Falls, with a fair prospect of success. The rubber vine, indigo, jute, opium, and practically all tropical plants, are possible articles of export in this low-lying region.

It is only for that portion of Tropical Africa which lies between 3000 and 5000 feet that there are real data on which one can speak with a certain degree of confidence. In the Shiré Highlands there is an article of export already, although the country is scarcely eleven years old. The plantations of coffee are now of very considerable extent, and are paying very well. Of course, as the majority have been made by people who possessed no previous experience, a very large number will fail. That is always the case with a new industry. Nevertheless, it seems quite certain that this is a good coffee country.

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[1] Major Ross, Sierra Leone, and Mr. Gray, Banana.

[2] The author has published (*Colonial Reports—Miscellaneous. No. 3. Sierra Leone*) a full account of Sierra Leone.

The major part of the land on which these plantations were formed appears to have been originally covered by scattered trees, not exactly a forest, and yet so dense as to prevent its being described as a park-like district. The rainfall is not very great, probably 40-50 inches on an average, which is barely sufficient, or according to some authorities not sufficient, to make more than a certain proportion of the district valuable.

If one now proceeds to examine the remainder of British Central Africa with these data in mind, one must believe that there is an enormous extent of country available. The same kind of scrub, and in most places a slightly *higher* rainfall, appears to be found along each side of the mountains bordering Nyassa (Livingstone, Kirk, Nyika, etc.), *i.e.* for more than 500 miles. A large portion of the Stevenson road plateau, or rather the valleys in it, appear quite similar, and I think the same country will be discovered all round Tanganika, from its shore (2700 feet) to about 3500 feet. Coffee was planted at Chirenjé mission, not far from Minimambwe, and was bearing well when the mission was abandoned. At Fuambo it seems to have been a failure. On the other hand, I obtained evidence on Tanganika that it had been cultivated there with success.

I consider this country is now the most favourable opening for a young fellow who has perhaps £500 to £1000 capital that I know of anywhere. Still, there is danger in trusting exclusively to a single plant as planters are now doing, and definite commercial experiments seem to me urgently required to show what may be used as an alternative.

When one smokes a very fair cigar made in a new country by a planter who has had no experience in planting, and works by books and rule-of-thumb, it is justifiable to look on tobacco as a very promising article of export. This was my experience at Mr. Buchanan's plantation at Blantyre.

Other things have not been properly tested. I think tea would probably succeed on the wetter portions of Mlanji, and probably in other parts, but I have no data to go on, except the appearance of the country and rainfall. Judging from the specimens in the Scottish Mission gardens at Blantyre, which are in a very exposed spot, it is *not* suitable to the larger part of British Central Africa. There is little doubt that various things of no great value can be easily produced, *e.g.* English potatoes, maize, tomatoes, and probably beniseed; but these are not sufficient, for the produce must be of considerable value to repay transport.

The climate is probably more healthy than most parts of India, but fever seems to be fairly prevalent, although of a mild character. (I do not think the hæmaturic form is *caught* on those parts which are above 3000 feet.) This makes a trip home after five years in the country distinctly advisable, if not absolutely necessary. It is said by those best qualified to know, that the use of horses on an extended scale is possible in the Shiré Highlands. The importance of this for the future comfort and well-being of Europeans can scarcely be exaggerated. On the whole, therefore, the Shiré Highlands are moderately fertile and moderately healthy.

If we turn to East Africa, the coffee zone ought to begin shortly before Kibwezi and to end before Machakos, which lies in the much more valuable colonisable area. It is extremely dangerous to give any opinion on this country. I do not think that any districts which are now occupied by thorny acacias and euphorbias can be recommended as a coffee-planting area. There are many ravines and valleys in this strip of country which are, however, occupied either by true jungle or by scrub, and it is in these that experiments should be first attempted. The history of Kibwezi seems to me curiously disappointing. There are certainly results, but these have been obtained by a quite unusual amount of labour and expense.

On the other hand, when one has passed the Masai Highlands, on the road to Uganda, and the 5000 foot contour is again reached at the watershed of the Nile, the country included in the coffee zone becomes enormous. It stretches from Kabrassi in Kavirondo to the foot of Ruwenzori, and from the Albert Nyanza in the North to a long distance south of the Victoria Nyanza, in German territory. Coffee of excellent quality flourishes in a semi-wild condition, both in Buddu and the islands of the Victoria Nyanza. The whole coast-line of this enormous fresh-water sea may be with considerable certainty set down as eminently fitted for coffee. It is probable that all those parts of the country which are now covered with the gigantic *mateitei*, or elephant grass, are also adapted for it.

With regard to other possible articles of export, one must first lay down clearly the unpleasant fact that only those of considerable value can possibly pay. Nothing worth less than £10 per ton may be taken into consideration, and, if the Mombasa railway is built, nothing of less value than £25 per ton can ever be exported with profit. Tobacco grows in every part of the Victoria region. Wheat can be raised in any quantity. Rice has not so far been a success, but any one who has seen the rice fields of Madagascar can scarcely doubt that every one of the enormous swampy rivers that intersect the plateau in every direction could be utilised for paddy fields.

I can only give as my deliberate opinion, after very considerable study of the country, that the Victoria region might become the greatest centre in the world for the production of those four articles. This is quite sufficient, for on the other hand, in the *demand* for articles of European manufacture, there are no African races (but the Hovas) who can compare with the Waganda.

With regard to the climate, the death roll is very high already, but large allowances must be made for the strain involved in getting there, as well as for the discomfort and want of civilisation. Under present conditions, European vegetables and cattle appear to do fairly well, but horses do *not* seem to thrive in Uganda. The rainfall is not too heavy, but there is fever, sometimes of a bad type. On the whole it may be most safely considered as inferior to the Shiré Highlands, but not markedly worse. Europeans should certainly not stay for more than three years.

Looking back on the whole coffee zone, the fact of the opening for an

almost indefinite number of young men of the means of obtaining a livelihood should be remembered in connection with the expenditure of public money, as this fact scarcely affects statistics, and is liable to be overlooked.

We have still to consider the colony zone. It is only this portion which can ever be considered a literal expansion of England, and it is relatively of small extent.

In British Central Africa a part of the Stevenson road, and the Nyika plateau is above 5000 feet. A ridge of very high land, interrupted only by the Malagarasi river, runs northwards along the east of Tanganika through Karagwe and Ankole to within a short distance of Ruwenzori. Most of this is in German territory, but in eastern Africa we have Ukambani (part), Kikuyu, and the Masai Highlands, which are probably the best portions of Tropical Africa for true colonisation. This country, in a natural state, consists mainly of grassy plains. Woods are only found along rivers, or on the sides of steep ascents. There is a fair rainfall, and the saving feature of cold nights to make up for a hot and trying day; in fact, it is a country entirely and absolutely fit for Europeans to live and bring up children in, so far as we can at present tell.

Certain feats of marching by Dr. Gregory and poor Joseph Thomson go to prove the healthiness of the country, and even a weak and shattered cripple like myself found that a twenty mile march left behind no evil effects. Moreover, cattle, sheep, goats, poultry, donkeys, wheat, and European vegetables seem well adapted to the climate. So far as it goes, this is eminently satisfactory, but it is not nearly sufficient. One must hold out prospects of more than the bare essentials of existence to induce colonists to go out and settle in the Masai Highlands.

This country is separated from the coast by a stretch of at least 200 miles of barren and waterless desert, which is, speaking plainly, worth nothing. Even with a railway, produce to be exported to England must be worth at least £4, 10s. per ton to pay merely the cost of transport to the coast (£2, 10s.)[1] and from the coast to England (£2), and besides this there are all expenses of cultivation to be added.

If we ask what other valuable products are possible in the Masai Highlands, it is difficult to answer. I very much doubt if coffee can be grown at all above 5000 feet. The banana and sugar can be cultivated up to 6600 feet, but they do not yield profusely at such an altitude. Tea requires a heavier rainfall than appears to be general on the Masai Highlands, and all other plants which one could suggest have not been tried. There is only one which appears to me to have a good prospect, viz., tobacco. All one can say now is, that colonists in this country would have to drive their cattle and sheep to the coast and make cigars!

Of course a Government station at Kikuyu, carried on by a tropical planter, could within four years definitely determine what plants afford encouraging prospects, but with our Government it is practically hopeless

[1] Take five shillings per train mile for working expenses, and an average cost of £3000 per mile to build the railway, and the freight must be at least this amount.

to expect such an experiment to be made, and very probably it may be better, on the whole, to wait for the experience of pioneers.

The best advice I can give any intending pioneer is to pitch his camp on an exposed grassy knoll, very far from any swamp but pretty near a river, and also, which is the most important, quite close to a forest-clad hillside, on which he can form his experimental plantation, trying coffee, perhaps tea, indigo, tobacco, and as many other things as he can obtain. He should watch these carefully for four years before he attempts to extend his planting, and at the same time build his station, sow his corn, and get as many cows as possible. Then he should go home and bring out a wife and a supply of the best varieties of that plant which does best, and found a county family.

He will have to work hard, for that is a necessity in all healthy countries, but with anything over £1000 he would probably have an infinitely better chance than nine men out of ten in this congested and worn-out Britain.

THE BRITISH ASSOCIATION, 1895.

THE meeting of the Association was held this year at Ipswich, under the presidency of Sir Douglas Galton, K.C.B., D.C.L., F.R.S., who delivered the opening address on Wednesday, September 11th. On the next day work was commenced in the sections.

The President of Section E—Geography—was Mr. H. J. Mackinder. His address forms the first article in this number of the *Magazine*. The first paper on the list was read by Mr. H. Swainson Cowper, and described "A Journey through Tarhuna and Gharian in Tripoli."

This short excursion was made with the express purpose of investigating a series of megalithic ruins, which were known to exist, but of which nothing has been hitherto known, except brief notices on one or two sites mentioned in the writings of the travellers Barth and Von Bary. The author travelled first south-west, and entered the Tarhuna district by the Wadi Doga, which appears never to have been entered previously by an English traveller. The Wadi Doga is a fine valley about 800 feet above sea-level, surrounded by hills about 800 feet higher, and contains numerous ancient sites of megalithic temples, some in a fair state of preservation. After visiting the Tarhuna plateau, the author rode north-east, and, crossing the Wadi Daun, reached the foot of Jebel Msid, lying at the east end of a wide and beautiful valley called Kseia. Having examined the ancient sites here, he retraced his steps to the Tarhuna plateau, which he crossed to the south-west, and entered a country of more mountainous character. These hills are partly in Tarhuna and partly in Gharian, and his route was crossed at frequent intervals by important watercourses running north towards the coast. The country, like the Tarhuna plateau, is nearly treeless, and in March very poorly supplied with water.

Throughout the district game of any sort is most rare, nothing being seen except quails, partridges, a few hares, and a wild cat. After crossing the Wadis Bir el War and Gethathet Dum, the author arrived at Wadi el Ghan, a southern prolongation of the important Wadi Haera, which leads straight to Tripoli.

Mr. Miller Christie then read a paper advocating a full examination of Rockall, which, as regards the surrounding depths, seems to belong to Iceland rather than to the British Isles; and an account by Dr. A. Markoff of "Western Siberia and the Siberian Railway" was read by Dr. Mill.

On Friday, the meeting of the section was opened by Herre C. E. Borchgrevink with a narrative of his experiences on board the *Antarctic*, and a scheme for further exploration. His voyage was noticed at p. 272 of this volume. The two most important papers read in Section E were, the one by Dr. John Murray on "Oceanic Circulation," and the other by Mr. H. N. Dickson on "Oceanographical Research in the North Sea." Dr. Murray exhibited some charts showing the salinity of the waters of the oceans when reduced to a uniform temperature, and briefly referred to certain consequences that follow from this distribution. Mr. Dickson's work on board the *Jackal* was briefly traced on p. 136; in the paper referred to above, he connected the movements of the waters of different salinity in the North Sea with the circulation of the North Atlantic, and pointed out that a knowledge of the distribution of these waters in each month of the year, and of the intimately connected contours of temperature, is calculated to give material assistance in weather forecasting. Unfortunately no full abstract was printed of either of these papers.

Mr. J. L. Myres discussed the maps of Herodotus.

The geographical digressions in the History of Herodotus are intended to supply the place of an atlas, and can be partially reinterpreted into pictorial form. That such pictorial maps were used, even before Herodotus's time, is clear from v. 49. Herodotus's descriptions are intentionally diagrammatic, and only give skeleton outlines, on which the details are understood to be filled in. The general proportions are indicated, not by formal latitude and longitude (ascribed to Eratosthenes), but (1) by lists of places which are in the same straight line (ii. 34, iv. 181 ff.), and by columns of names which run up and down or across the map (iv. 37, v. 49), which is thus subdivided into rectangular areas (iv. 37, 99), or parallel strips (iv. 181); (2) by the presumption that a general symmetry is maintained in the distribution of land and water north and south of a natural "equator" (ii. 26, 33; iii. 115; iv. 36, 37).

This "equator" is indicated in two different real-latitudes in the different digressions, and these two "equators" are associated with different principal north and south meridians.

Hence we may infer that Herodotus used two distinct maps based upon independent traditions and explorations, each best adapted to illustrate a different section—namely, the Greek and the Persian "halves" of the known world—but not consistent with one another in the parts where they overlap.

A. The Ionian navigating-chart of the Mediterranean and Euxine: an early edition is used by Aristagoras of Miletos in v. 49. Its principal meridian lies through the mouth of the Nile, the Cilician Gates, Sinope, and the mouth of the Danube; its "equator" is the line of the Royal Road, extended from Miletos on the Maeander to the ford of the Euphrates, produced westwards through the Pillars of Herakles, and eastwards (*a*) by Aristagoras, down the Choaspes conceived as flowing east, past Susa into the Eastern Ocean; (*b*) by Herodotus himself superimposed on the Pactyas equator of Map B.

B. The chart founded on Phœnician and other Oriental sources, and completed by Skylax of Karyanda, as a survey for Darius of the Persian empire. Principal

meridian: a line of nationalities from the mouth of the Choaspes to the mouth of the Phasis (iv. 37) taken as parallel with the Euphrates-Tigris basin, and perhaps representing the meridian either of Susa or of Ecbatana. From this project westward two promontories—Asia Minor and Arabia—washed respectively on their outward sides by the Euxine and the "Red Sea." Arabia "in theoretical geography leaves off" at the isthmus of Suez, as Asia Minor does at the Dardanelles, but is "practically found to be continuous" with Libya (iv. 39). Between the peninsulæ lies the "Mediterranean" Sea, with Cyprus in its axis (cf. v. 49); the equator bisects the Mediterranean from the Pillars of Herakles, through Cyprus, to the Phœnician coast; thence (probably through Ecbatana) down the Pactyas river (perhaps the Ganges) into the Eastern Ocean. The southern coast-line of Asia is determined by the voyage of Skylax (iv. 44); the northern is inferred thence by symmetry, and accommodated to the known Caspian (iv. 40).

The current controversy as to the frontiers of the continents refers also to these same maps (iv. 36, 39, 41, 45, 197), and to the map of Hecatæus (iv. 45), and is explained, together with the distortion of the eastern half of the known world, by the difficulty of apportioning a circular world among three traditionally equal continents, one of which, Libya, has since been determined to occupy only one quadrant of the circle, and to be bounded by the south half meridian and the west half equator, while the opposite quadrant remains still practically unknown.

Major Darwin read a brief report on the late Geographical Congress, and Mr. W. B. Blaikie gave an explanation of his Cosmosphere and the problems illustrated by it.

The next meeting of the section was held on Monday, September 16th. Mr. G. F. Scott Elliot spoke on Ruwenzori and East Africa, the subject of which he treated in his lecture delivered before the Society last May. As Mr. Elliot's lecture was not published in the *Magazine*, part of his abstract is inserted here:—

Ruwenzori is 16,500 feet in height. Dr. Gregory, in a paper to be published in the Journal of the Geological Society, has pointed out grounds for supposing that it is a "scholl" mountain. The central core, of which I brought home a specimen, has been, in a sense, forced through the schists, which I found to dip away from it in all directions.

It is allowable to suppose that this process resulted in lines of crack or weakness. I found, along what may be supposed to be lines of weakness of this kind, a series of relatively recent volcanic craters and crater lakes. The most important is that which has produced the division of the Albert Edward into the Nyanza proper and Lake Ruisamba. The Salt Lake and four other craters belong to this line, which is approximately south-east. There is another running south-west, and along the eastern side one finds at least two others; one, at Vijongo, is in a north-easterly direction, whilst the other is nearly due east from Kyatwa and Butanuka.

These have all had the most important effect on the geography of the country round the mountain. The recent volcanic area also extends across the Albert Edward and occupies a stretch of its eastern shore.

It seems strange that the mountain escaped notice so long, but it is obviously the "Blue Mountains" of Sir S. Baker, and the "mountains of Usongora" which recur frequently in Emin Pasha's letters.

The reason is, probably, that it is frequently covered with clouds. At about 10 A.M. thick clouds usually hang at an average level of 7000 feet to

11,000 feet, though they are much lower in the narrower valleys. As the morning advances, they gradually ascend, and may vanish altogether at about 5.30 P.M. In fact, before 5.30 P.M., or occasionally just about sunrise, it is most unusual to see the summit except from a very great distance.

The vegetation follows the average movement of this cloud belt. From 5000 to 7000 feet the surface is covered by shrubs and cultivation. The true mountain forest begins at 7000 feet, and extends to 8600 feet. From 8600 to 10,000 or 11,000 feet is a bamboo jungle; and from the latter level to 15,000 feet is a heather zone. The forest is very dense, full of creepers, and with, occasionally, very fine timber. Sometimes it contains tree-ferns, and is extremely similar to the wet forests of the Congo.

Animal and bird life is scarce. Bush-buck may be seen occasionally, and there are *Cercopithecus* n. sp., *Colobus*, probably a new species, various squirrels, *Galago*, etc., but all are unusual. Butterflies are particularly scarce.

The mountain is in reality a meeting-place of floras. The higher altitude plants are probably of Abyssinian origin, and have a very strong Mediterranean affinity. Those in many of the more humid and wet valleys at from 6600 to 7600 feet are of a distinctly Western type, while in the drier valleys below 5000 feet one finds Victoria region plants, and above that level plants of Abyssinian affinity or belonging to the Ankole-Karagwe hills. Besides all these there are on this mountain many endemic species.

Mr. E. G. Ravenstein then read his "Report on the Climate of Tropical Africa." In this, the fourth, report of the Committee appointed by the British Association, abstracts are given of the records at thirteen stations in British East Africa, and also at Zomba and Lauderdale in the African Lakes Protectorate, at Bolobo on the Congo, and at Warri, Benin.

Captain S. L. Hinde, who accompanied Lieutenant Dhanis on his expedition against the Arab slave-traders, gave an interesting account of his adventures:—

In 1891 Captain S. L. Hinde landed at Boma, and went up the caravan road to Stanley Pool. After four months' residence in the neighbourhood of the Pool, part of which was spent in exploring, he went up to the district of the Lualaba, and, arriving there, was immediately ordered to join an exploring expedition to Katanga. The force consisted of 350 regular soldiers, a Krupp gun, and porters. While on the road to Katanga they were attacked by Tippo Tib's slave raiders, under the command of his son Sefu. After the defeat of Sefu, a general rising of the Mahometans and the federation of all the branches of Arab slave traders of the Upper Congo and its tributaries occurred. The war which ensued resulted in the complete overthrow of the Arab slave trade in Equatorial Africa west of Tanganyika. After the war Captain Hinde surveyed the unexplored parts of the Lualaba and Lukuga, between Kasongo and M'Bulu, connecting the surveys of Joseph Thomson with those of Stanley and his successors. In these regions the extreme fertility of the soil is noticeable. Owing to the intense heat, great moisture, and alluvial soil, all forms of vegetable life grow with an incredible rapidity. This vast tract of country is intersected by waterways navigable by steamers for some thousands of miles, and, as can be realised, might easily be exploited by Europeans.

As a result of the Arab overthrow, the traffic which formerly went down to Zanzibar from Nyangwe and the Lualaba now follows the Congo to Stanley Pool

and the Atlantic. The whole Congo basin must be specially adapted for coffee growing, as in every part of the forest wild coffee, of excellent quality, is abundant. While waiting for the coffee plantations to yield, rubber—which is found everywhere, and which only requires collecting—would be an enormous source of wealth.

Another paper, on the Japanese Alps, containing much that was new and attractive, was read by the Rev. W. Watson :—

The two chief mountain systems of Japan, running north-east and south-west respectively, meet in the centre of Hondo (the main island). Here, where the country attains its greatest width, the peaks rise to the loftiest heights, and exhibit the grandest characteristics in the range of the "Japanese Alps." The distant view resembles that of the Sierra Nevada of Spain, to which these mountains correspond in position and elevation. The range rises from the Sea of Japan, about 37° N. latitude, and extends nearly 100 miles southwards, throwing off spurs east and west. Some of the highest peaks are volcanic, others of granite ; or, as in the case of Yarigatake, the highest (10,500 feet), of hard brecciated porphyry.

Owing to its position, the chain forms a barrier to the Siberian winds after their passage over the moist atmosphere of the Japan Sea, and causes an extraordinary snowfall in the winter, sometimes capable of burying whole villages, on the west side, whilst the east at the same time is comparatively free from snow.

No traces of glacial action have been discovered, but snow lies in summer as low as 7000 feet in various places. Remarkable solfataras are found on some of the volcanic peaks, notably on Tateyama, in the north.

Although travel in these wild regions is very rough, still the people dwelling on the outskirts of the main chain are kind, polite, and hospitable to a degree. Many of their customs and superstitions are very curious. They hold a strong belief in the power of foxes, badgers, wasps, etc., to "possess" human beings.

It is hoped that Mr. Watson may relate his experiences to the Society sometime during the coming session.

In a paper contributed by Mr. J. T. P. Heatley, the advantages of the port of Akik on the Red Sea, as the terminus of a railway which would afford the easiest means of communication with the Upper Nile, were insisted on.

The port of Akik is on the best bay of the Red Sea, and a line of railway from Akik to Khartum by way of Goz Rejeb is the best route to bring Khartum and the Upper Nile into commercial relations with the maritime highways of trade. As soon as the line is made to Goz Rejeb, the port of Akik will be in direct communication with the Upper Nile from June to September, during which time the Atbara and the Nile at the Sixth Cataract are navigable.

From Akik to Goz Rejeb the distance is from 260 to 280 miles ; the highest part of the route is 1650 feet, with easy grading and no difficulties. To Goz Rejeb as a nodal point, where routes meet from all parts, the trade of the Upper Nile, of Darfur and Dongola, can come by ship and caravan. But the importance, commercially and strategically, of Khartum demands the line from Goz Rejeb, a distance of some 170 miles.

From Khartum, the Nile, with some of its tributaries, is navigable for some

1500 to 1700 miles. The Blue Nile is navigable for 350 miles; the Sobat for 150 to 300 miles; the Bahr el Ghazal for 400 miles; the Bahr el Arab for 500 miles. The Nile itself—the Bahr el Abyad and the Bahr el Jebel—is navigable from Khartum to Kiri, a distance of 1068 miles. Kiri might also be connected by rail with Fauvera on the Victoria Nile.

The other contributions to this day's proceedings were "The Start of the Jackson-Harmsworth Expedition," by Mr. A. Montefiore, and "The Struggle for Existence under Arctic Conditions," by Mr. A. Trevor-Battye, who visited Edinburgh this spring.

The meeting on Tuesday was devoted to Asiatic exploration. A long paper on Formosa by Mr. John Dodd was read, the contents of which are very briefly and imperfectly indicated in the following abstract :—

This paper gives an account of observations and explorations in the island of Formosa made by the author during his residence there from 1864 to 1890. After referring to the work of British naval officers, consular officers, commissioners of Chinese customs, and others, and giving a general geographical description of the island and its commerce, the paper goes on to discuss the probable origin of the aboriginal tribes occupying the highest mountain districts. The mode of life of the savage inhabitants is described—their dress, weapons, methods of hunting, marriage customs, etc.,—and special reference is made to the practice of head-hunting, whether indulged in from motives of revenge or as a pastime merely. The paper next deals with the Pepawhano, or descendants of the savages of the plains, their spoliation by Chinese immigrants, and the work of the Dutch missionaries amongst them. In the concluding section the author refers to the colonisation of parts of Formosa by immigrants from Fokien, and to the Hakka invasion of the hill districts. Some account is given of the opening up of foreign trade, especially in camphor, coal, and tea, and an estimate is formed of the commercial resources of Formosa, and of the prospects of their development.

Mr. Theodore Bent's report of his journey in Southern Arabia, the chief points of which were noted on page 479, was read, and Dr. A. Markoff contributed papers on the Russian Possessions in Central Asia, and the towns of Northern Mongolia. Some "Notes on the Topography of Caria," by Mr. J. L. Myres, brought the work of the section to a close.

A series of short journeys in the neighbourhood of Mylasa, Keramos, and Halikarnassos, result in a number of corrections of the physical features : especially a considerable extension north-westwards of the basin of the Kartal déré, which issues at Keramos; it has a common watershed with the China Chai, which joins the Mæander near Aidin.

The geology of the district determines its physical features; the limestone plateau is drained partly by swallow-holes from enclosed basins, partly by deep ravines; beneath, the limestone crystalline rocks are upheaved in two parallel anticlinals running from north-west to south-west, one forming the range of Latmos, the other extending from the root of the peninsula of Knidos, through that of Myndos, and as far as Patmos. About Myndos and in Kos was a volcanic area, active both before and after the deposition of the cretaceous limestones.

Remains of ancient Carian and Lelegian civilisation have been examined, and the following ancient sites have been identified and verified :—Pedasa, one at

Karajahissar, one near Bitès (Ghiuk Chalar); Kindya at Utch-bounar; Telmessos, two towns and the oracular temple on the Kara Dagh; Karyanda at Ghiöl; Termile at Tremil; Pelea at Borghaz; Taramptos at Taranda.

At a meeting of the General Committee on Monday, Toronto was chosen as the place of meeting of the Association in 1897. Next year the meeting will be held in Liverpool, commencing on September 16th.

At the meeting of the General Committee on Wednesday, the committees connected with the work of the sections were reappointed, and the money grants renewed.

JOSEPH THOMSON.[1]

By J. G. Bartholomew, Hon. Secy. R.S.G.S.

By the death of Joseph Thomson, Scotland has lost the last of her family of African pioneers—the last of that distinguished group which includes the names of James Bruce, Mungo Park, Denham and Clapperton, Livingstone, Grant, and Cameron; for in Thomson's time the pioneering work in Africa may almost be said to have been completed.

Born in February 1858 at the village of Penpont, near Thornhill, in Dumfriesshire, Thomson was the youngest of five sons, and is still survived by his father and mother. Coming of a family that well illustrates the best characteristics of the typical Scot, he was naturally endowed with a resolute, self-reliant spirit and a strong constitution. Brought up among the surroundings of his father's sandstone quarry, his thoughts received a natural bent towards the wonders of geological science, and the rambles of his boyhood over the Dumfriesshire hills developed a strong interest in the study of nature and an enthusiasm for exploration. At the early age of eleven, inspired by a book of African travel, this enthusiasm led him to make an earnest and tearful appeal to his mother, that she would persuade his father to give him sufficient money to enable him to join Stanley in his first search for Livingstone! From this time onwards Africa had a wonderful fascination for him, and through school life in the country, and during his college life in Edinburgh, the discovery of its mysteries seemed to be the goal of his ambition. At the University he distinguished himself in natural science, and gained the medal for geology in Sir Archibald Geikie's class.

It was not long before an opportunity of realising his ideals presented itself. He read that the Royal Geographical Society's Expedition, under Mr. Keith Johnston, was about to start in 1878 for the exploration of the Central African Lakes, at once volunteered to go in any capacity, and, as he says, "to my inexpressible delight and surprise was accepted." The story of that journey is romantic. Before the expedition was far from the coast, its leader succumbed to dysentery, and Thomson, a youth of

[1] See portrait, vol. ii., page 65, *S.G.M.*

twenty-one, with little or no experience, was left to his own resources. To have conducted his men safely back to the coast would have been commendable, but he had higher aims than that, and boldly resolved to carry out the full programme of the Geographical Society. Starting from Behobeho, where Keith Johnston died, he made his way to Nyasa, which he was the first to reach from the north; crossing over to Tanganyika, he solved the problem of its Lukuga outlet; on his return journey he visited Lake Leopold, and after eighteen months of travel arrived safely at Zanzibar in June 1880. This expedition filled up many blanks on the map of East Africa, and determined much of its general geology. His work exceeded the expectations of the Geographical Society and gave the greatest satisfaction. The results of this journey were published in two volumes entitled *To the Central African Lakes and Back*.[1]

Shortly after his return, Thomson was commissioned by the Sultan of Zanzibar to investigate the value of certain reported coal-beds to the south of the Rovuma river; this expedition occupied three months, and resulted in the discovery that the supposed coal was merely shale. His honest but disappointing report was displeasing to the Sultan, who afterwards rewarded a less scrupulous geologist for a more hopeful view of the unpromising shale—but it is still shale.

Immediately on his return home the Royal Geographical Society showed their confidence in him by asking him to lead an expedition for the exploration of the Masai country as far as Victoria Nyanza. Because of the fierce and warlike character of the natives, this was a most difficult undertaking; several Europeans who entered the country failed to return alive, and even armed caravans were turned back. But, undaunted, he set forth from Zanzibar in March 1883 with a determination to succeed in his own way, avoiding hostility and bloodshed, and in the spirit of his adopted Italian motto—

> "Chi va piano va sano,
> Chi va sano va lontano."

'He who goes softly, goes safely; he who goes safely, goes far.'

He got as far as Kilimanjaro, which he ascended to a height of 9000 feet, and then attempted to pass to westward; but the hostility of the natives being aroused by the fighting engaged in by Dr. Fischer's expedition, which had just preceded him, Thomson judged it wiser that his small band should avoid fighting, and decided to retreat to the coast. Reaching Rabai in May, he replenished his stores and started again in June; passing this time to the east of Kilimanjaro, he reached Lake Naivasha in September, crossed over the plateau to the foot of Mount Kenia, explored Lake Baringo, and in December 1883 reached the shores of Victoria Nyanza in Kavirondo. Commencing his return journey at this point, he visited the caves of Mount Elgon on his way back to Lake Baringo. From this stage the expedition suffered much hardship; the stock of provisions was exhausted, all the cattle in the country were

[1] London: Sampson Low, 1881.

stricken with disease, and for months the only food obtainable was almost putrid flesh. Thomson was prostrated with dysentery, and for six weeks lay helpless in a dismal hut at Mianziani, a cold, bleak region among the hills. Determined to make an effort to escape alive from this inhospitable country, he ordered his men to push on to the coast. For some hundreds of miles they carried him, a living skeleton; but his strong constitution prevailed, and, revived by the change to a warmer climate and better food, he reached the coast in safety at the end of May 1884.

During the latter part of this long and perilous expedition he had not been heard of at home for more than a year, and his return aroused keen public interest. He was cordially welcomed everywhere. The Royal Geographical Society awarded him its "Founder's Medal" in recognition of his valuable services in exploring this hitherto dreaded and unknown country, now incorporated in the British Empire. His book *Through Masai Land*,[1] published in 1885, gives an account of this expedition.

Thomson's next work was in the Niger country, and was more of a diplomatic than of a geographical nature. The Germans were trying to establish their influence in the Niger-Benue basin, and the National African Company, now the Royal Niger Company, anxious to forestall them, engaged Thomson to proceed to Sokoto, Gandu, and the neighbouring states, and negotiate commercial treaties with the chiefs. This enterprise was so successfully accomplished that these countries are now included in the British Sphere of Influence. His experiences during this journey were published in a most interesting series of articles in *Good Words*.[2]

Shortly after his return from the Niger, Britain was agitated by the fate of Emin Pasha on the Upper Nile, and Thomson was looked to as the probable leader of a relief expedition by the direct route through Masailand. Ultimately, however, the East Africa Company decided to send Stanley by the Congo route. Thomson was asked to join that expedition, but could not see his way to do so. Incapable of remaining idle, he for some time settled down to literary work, contributing African articles to several of the monthly journals, and, in conjunction with Miss E. Harris Smith, wrote a romance descriptive of savage life in East Africa, published under the title of *Ulu*.[3] This being completed, and no special outlet presenting itself for his energies, he next undertook an expedition, on his own responsibility, for the exploration of Southern Morocco. In this he was assisted by the Royal and other scientific societies. Accompanied by Lieut. Harold Crighton Browne, he set out in March 1888 and penetrated to the recesses of the Atlas mountains, but was prevented from further exploration to the south by the opposition of the native tribes. In this journey he met with an unfortunate accident, being thrown forward on to the pommel of his mule's saddle, and sustaining injury which brought on a painful disease of which he was never cured. Before his work in Morocco was completed, he was called home with the view of his leading an expedition for the relief of Stanley, whose long absence, without news, had at that time occasioned public anxiety;

[1] London: Sampson Low. [2] 1886. [3] London: Sampson Low, 1888.

but, almost simultaneously with Thomson's return, intelligence was received which made the proposed expedition no longer necessary. He now published his *Travels in the Atlas and Southern Morocco*,[1] and, during a period of rest at home, wrote with all the sympathy and appreciation of a fellow-explorer a *Life of Mungo Park*.

Thomson's last expedition was undertaken on behalf of the British South Africa Company. Acting under the instructions of Mr. Cecil Rhodes, he started in 1891 with the object of exploring the Barotze country and reporting on other newly acquired possessions of the British South Africa Company. Accompanied by Mr. T. A. Grant, a son of the companion of Speke, he made his way to Kotakota on Nyasa, and from thence crossed over to Lake Bangweolo, but there misfortune overtook the expedition, smallpox ravaged the camp, Thomson's health broke down entirely, and after reaching the borders of Msiri's kingdom he had to turn back. He was carried a distance of over 700 miles to Blantyre, where, after six months' kind nursing at the mission station, he regained sufficient strength to enable him to return home. Notwithstanding the misfortunes of the expedition, his report of the country gave satisfaction to the company.[2]

After his return in 1891 the remainder of his life was spent in efforts to regain health, but his strong constitution had been weakened by African fevers, and his troubles were slow to yield to medical treatment. A severe cold, caught in London, led to pneumonia; after an acute illness, he gained sufficient strength to enable him to go out to South Africa, where he was the guest of Mr. Rhodes, and improved rapidly in health. Unfortunately, however, he returned too soon. After spending the summer at home, he went to winter in Italy with the intention of returning to South Africa in spring, but on his way to London an attack of influenza at Mentone prostrated him. He was taken to London, but never rallied. To the last the strong, brave spirit that had carried him through so many dangers never deserted him. "I have faced death for many years, and I am not afraid to face it now," he said. In the hospitable home of a kind friend in York Gate death claimed its own; the spirit left its enfeebled and worn-out body on August 2nd, 1895. The International Geographical Congress was then sitting in London, and expressions of regret at his untimely end were heard on all sides from his fellow-geographers and travellers. In his long illness, as in his African hardships, he bore everything with Spartan endurance. He is buried in his native churchyard at Thornhill, where a memorial monument is to be erected by his friends.

Although taken away at the early age of thirty-seven, Thomson's life, measured by work achieved, was a full one. As an explorer he was a keen and skilled observer, and his extensive additions to African geography have always stood the test of subsequent examination. In his views on the development of Central Africa, many thought him pessimistic, but he would raise no false hopes, nor agree with theories that were not founded on fact; he preferred to stick to the plain truth even when

[1] London: Philip and Son, 1889. [2] *Geographical Journal*, vol. i. pp. 97-121.

it was very unacceptable. In dealing with the natives he was distinguished by his humanity, and could justly boast that he had never sacrificed a human life in all his troubles with them. His genial manner and happy resource helped him through many a difficulty and secured him friendship with the natives, where less forbearance would have meant bloodshed. To his zeal as a sportsman the discovery of several new species of antelope is due; he was a steady shot, and encountered many hairbreadth escapes in the pursuit of big game.

In the success of the Scottish Geographical Society he was always much interested, and addressed several of its meetings. At its foundation, in 1884, he was made an Honorary Member, and in 1892 was awarded its medal. As a friend he was hearty, humorous, and even boyish in his good-fellowship, and possessed a spirit of true chivalry, which, to those who knew him best, seemed the keynote of his life.

GEOGRAPHICAL NOTES.

By The Acting Editor.

Dwarfs in the Pyrenees.—Mr. David MacRitchie went, in 1894, to the district of Ribas, to inquire into the existence of a dwarf race. "Except for the hairless faces of the men," he says, "it did not appear to me that there was anything peculiarly Mongolian about these people, as Professor Morayta asserts. Nevertheless I am inclined to regard them as the remnants of a race. Undoubtedly cretinism and goitre enter into the question, but of the eleven dwarfs I saw in the Ribas neighbourhood, only two were afflicted with goitre." If the small stature and other characteristics of these dwarfs, he asks, "are simply the outward signs of cretinism, and if cretinism be due to environment, how comes it that other people, living exactly the same life, are absolutely free from any such defects of mind or body?"

Five portraits of Pyrenean dwarfs are reproduced from Mr. MacRitchie's photographs in the *Internationales Archiv für Ethnographie*, Bd. viii. Heft 3.

The Sea of Marmora.—The results of the Russian exploration in September and October 1894 are summarised in *Globus*, Bd. lxviii. No. 6. The bottom of the sea forms three nearly parallel hollows. The western and middle are each 700 fathoms deep, while the eastern is 820 fathoms deep. The greatest depth sounded was 895 fathoms. The eastern deep basin occurs in the central region of the earthquake which shook Constantinople on July 10th, the most widespread of recent earthquakes. The sounding of the expedition showed that a sinking had taken place since the last previous soundings were made. The examination of the mud from the deep depressions shows no trace of volcanic products. As regards chemical properties the water of the Sea of Marmora is akin to that of the Mediterranean, and only the upper layer gives indications of its origin in the Black Sea. The very different degrees of salinity in the Black and Mediterranean Seas causes a double current in the Sea of Marmora, the salter water of the Mediterranean flowing inwards along the bottom and the lighter water of the Black Sea flowing outwards at the surface. The limit between the currents lies at a depth of 8 to 14 fathoms, and thus the lower part of the Sea of Marmora is filled with Mediterranean water of 38 *promille* salinity, while the water of the upper layer is but little salter than the

Black Sea (about 24 *promille*). The surface temperature was 67·3° F. on an average, with variations not exceeding 2·5°. The change of temperature is scarcely noticeable down to a depth of 8 to 14 fathoms (Black Sea water), but then the temperature falls almost at a bound to 60½°; at 116 fathoms (100 sagenes) it is 58°, and from 233 fathoms to the bottom, 57½°. The constant movement of the water promotes a strong vertical circulation, prevents the water stagnating in deep hollows, and brings in a plentiful supply of oxygen; sulphuretted hydrogen is not found at all. Organic life exists everywhere, even in the deepest parts.

ASIA.

The Marine Survey of India.—The survey of Palk Strait, in progress at the date of the last report, was continued up to April 19th, and, when the *Investigator* left for Bombay, had been completed along the north coast of Ceylon from Point Pedro on the east to Karativu on the west. On October 17th the *Investigator* and *Nancowry* sailed from Bombay to Karachi, and the survey of the coast was continued until the end of December, when the Hajamro mouth of the Indus was reached. Here a shallow spit, formerly reported to extend three miles to the south-west, was found to have disappeared. On December 31st a course was steered for a depth of 145 fathoms, shown on the chart in lat. 22° 49′ N., and long. 65° 38′ E., about sixty miles outside the hundred fathom line; in this position a sounding of 1055 fathoms was obtained. Having called at Bombay, the *Investigator* passed over the Sesostris and other banks off the west coast of Hindustan, which were new ground for trawling, and reached Palk Straits on February 5th. A triangulation, with buoys as marks, was carried across the Strait, and the soundings between India and Ceylon were completed. When the report was drawn up the surveying officers were working off the north coast of Ceylon between Karativu and Delft islands. Tides were observed continuously at Kankesenturai.

In Surgeon Anderson's report the following details of the principal trawls are given :—

Station.	Position.	Depth in Fathoms.	Deposits and Bottom Temperature.
177	13° 41′ 49″ N., 73° 07′ 0″ E.	636	Green mud. Temp. 44·2° F.
183	23° 08′ 22″ N., 65° 49′ 45″ E.	890	Soft grey mud. Temp. 40·5°.
184	22° 14′ 25″ N., 67° 08′ 55″ E.	947	Grey mud. Temp. 40·5°.
192 & 193	15° 11′ 0″ N., 72° 28′ 0″ E.	912-931	Grey ooze. Temp. 40·25°.
194	13° 47′ 0″ N., 72° 3′ 45″ E.	891	Grey ooze. Temp. 41°.
197	9° 34′ 57″ N., 75° 36′ 30″ E.	406	Green mud. Temp. 48°.

No startling novelties were brought up by the trawl in Palk Strait, though some crabs new to the Indian record were caught, nor did a haul off Trincomallee yield any new specimens. At Station 177 *Calocaris Macandreæ* was caught, a crustacean which has been found in Loch Fyne at a depth of 180 fathoms, in the Gulf of St. Lawrence, and on the shore of New Zealand, but never before in Indian waters. A new species of *Doracidaris* obtained here was named after Dr. Alcock. A trawl was made in the Indus swatch, in lat. 23° 04′ 54″ N. and long. 66° 48′ 15″ E., but only one specimen was obtained, and subsequent hauls off the Indus delta showed that the soft brown mud at the bottom is not inhabited by any large variety of animals. On the shores of the delta a large *Ocypoda* with purple chelæ was obtained, differing from any of its species on the Madras, Ceylon, or Lakadivh shores. The creeks swarm with fish and water-snakes. Among the

former is an electric ray, *Astrape dipterygia*, which, though able to give a powerful shock whilst in the water, is perfectly innocuous in the air. On the voyage from Karachi to Bombay the hauls in less than 150 fathoms were unproductive, but rare specimens were fished up from 890 and 947 fathoms. At Station 184, *Hemiaster*, a genus new to Indian waters, was found. The richest haul was at Station 197, not very far from the Travancore coast and slightly to the north of Aleppi. Both in diversity of species and numbers of individuals it surpassed any other made during the last three seasons. The most common form was a salmon-red Ophiuroid, 1½ feet in span.—*Administration Report of the Marine Survey of India*, 1894-95.

Maps of Manchuria.—We are indebted to the Rev. Jas. W. Inglis, of Mukden, for the following communication :

"As the recent war in the East has attracted much attention to Manchuria, it may be useful to review the steps that have been taken in determining the geography of that country, and thus to estimate the present state of our knowledge of the subject.

"The basis of all existing maps is of course the survey conducted by the Jesuit missionaries, the Manchurian section of which was completed in six months of 1709. The merits and demerits of their work are well known to geographers.[1] It is enough to say that while it is deserving of all praise, when we consider its early date and the limited time allowed for its execution, it is not sufficiently accurate either in the astronomical work or in local detail to be taken as a final authority.

"The first alteration necessary was to indicate the modern towns and roads, as the map was covered with names of cities which were mostly in ruins at the time of the survey. This was largely done by Dr. Alex. Williamson,[2] whose map still remains a store of information. Much of his work indeed is original, as he travelled through parts of East Mongolia and Kirin which were not settled till the close of last century. It does not appear, however, that he had leisure for astronomical observations, and, consequently, there are errors of position ; *e.g.* the road through East Mongolia to K'uan-ch'êngtzu is placed too far north. Moreover, in that part of the country which lay beyond his field of operation, notably that to the east of the high road to Kirin, there was no other course open but to reproduce the work of the Jesuits.

"From the journey of the Archimandrite Palladius[3] we have a sketch made by M. Nachwalnüch of the through route to the Russian frontier at Blagovaschensk, but there are errors of detail—as the placing of a town on the wrong side of a river —which suggest haste on the part of the compiler. The foregoing and other Russian observations were embodied in a map by Dr. H. Fritzsche,[4] which I have not had an opportunity of examining.

"In his *Atlas von China*, Von Richthofen includes Southern Manchuria. He has given a careful delineation of some little-known country towards the eastern frontier, and has exercised a praiseworthy restraint in printing only what he could find good authority for.

"An important map is that attached to *The Long White Mountain*, by H. E. James, 1888. Over many parts of the route traversed the information given is

[1] Cp. Von Richthofen : *China*, 1877, pp. 683-686. H. Fritzsche, *Geographische Magnetische u. Hyprometrische Bestimmungen in Mongolien u. N. China* (St. Petersburg, in Imp. Acad. *Repertorium für Meteorologie*).

[2] *Journeys in North China*, 1870, vol. ii.

[3] *R.G.S. Journal*, 1872, vol. xlii. pp. 204-217.

[4] *Map of N. China, Mongolia, Manchuria, etc.*, by Dr. H. Fritzsche. St. Petersburg, 1874.

unique, though we must share the author's regret that he was unable to avail himself of the observations made *en route* by Captain Younghusband. The public have indeed appreciated this map so highly, that it seems difficult to find a library with a complete copy of the work.

"The *Map of North-East China*, published in 1893 by M. Ch. Waeber, includes Manchuria up to lat. 43° 30′, and as it seems to embody all that had been previously published on the subject, it is with disappointment that we recognise how much remains yet to be done.

"The deficiencies in our present maps of Manchuria may be summed up as follows:—The upper course of the Liao river is wrongly laid down. The junction of the Hersu and Sharamuren, which is placed in lat. 42° 40′ N., long. 123° 14′ E., should really be about 43° 32′ N., 123° 28′ E. The Sharamuren was crossed in 1873 by Fritzsche[1] at 43° 15′ N., 118° 17′ E., where it had an easterly course. From there it must be assumed to flow north-east, and then turn round to the south-east and south, as it passes on the east side of the Chinese settlement of Tséng-chia T'un (approximately 43° 43′ N.). A few miles below this it receives the Hersu, flowing from the east, and the combined stream runs south-south-westwards for 60 miles, then turning eastwards and crossing the road to the north of Fak'umén, as the maps represent. Whether the discrepancy be due to a change in the course of the river or to an error of the early cartographers, I am unable to determine.

"The maps show a want of local knowledge away from two or three main roads. The courses of rivers are not accurately laid down, and many important market-towns and trade-routes are omitted. There are still large districts in which the maps have to depend on the Jesuit survey. Names still appear of cities which are now represented by grass-grown and forgotten mounds, while the cities of to-day are not mentioned. This applies especially to the eastern marches, which have been opened since 1875.

"From time to time the Chinese have published rough copies of the original survey, with the names of places brought up to date. A Japanese version of this appeared in 1875, but in the present year a map was published in Japan, extending to lat. 42° 30′, which bears the marks of independent labour. No indication is given of the methods used in fixing the positions, but the details are evidently the result of a systematic exploration of the country. The Japanese War Department is doubtless in possession of maps as much superior to this as it is superior to those published in the west."

AFRICA.

Between the Cunene and Zambesi.—Padre Leconte has forwarded a map of this country to the Lisbon Geogr. Soc. (*Bol.* 13a serie, No. 12), accompanied by a few notes. He asserts that the Cuanza does not issue from a lake. The supposed lake Mussombo is but a miserable pool, only some 300 yards across, out of which flows the Luiquisi, an affluent of the Cuanza. The watershed between the streams running north and south is almost imperceptible, so that it is hard to tell why they take different directions. The sources of the rivers to the west of Bihe are also intermingled with those of the Cunene, Cubango, and others flowing south. All these rise on the plateau of Mbuluoulu, which, far from being a chain of mountains, is indeed a hollow which is filled with water in the rainy season. This water finds its way by filtration into the rivers which flow off in all directions. The natives may all be denoted by the general name of Ganguella; they speak the same language

[1] *Repertorium für Meteorologie*, vol. iv. No. 3. St. Petersburg, 1874.

with two dialects. The Quioco, or Quivocue, of an entirely different race from the north, are scattered among them. The population attains its greatest density between the Cubango (Okavango) and the Cunene. Beyond the 18th degree of E. long. there is no important centre of population. With regard to climate, Padre Lecomte says that it is excellent on the plateau as far as the Cunene, and endurable thence to the Cueve and Cuanza, but very bad beyond long. 18° as far as the Zambesi.

Mauritius.—Major H. de H. Haig read a paper in April last before the Geological Society on the physical features and geology of this island (*Quarterly Journal*, vol. xi. Part 3). The three islands—Réunion, Mauritius, and Rodriguez—lie in the same line of volcanic activity, but are otherwise quite disconnected. Soundings lately taken in connection with a scheme for laying a telegraph cable have proved that between Mauritius and Réunion lies a level sandy plain at a depth of 1800 fathoms, with very steep sides, and are adverse to the theory that the Mascarene islands were at one time united. Mauritius is about 40 miles long by 27 broad, and is essentially a mass of volcanic *débris*, thrown out from craters now extinct. The mountains consist of superimposed lava flows, generally with burnt volcanic ash between the layers. They are very precipitous, especially on the seaward side, and many of them are of very fantastic form, such as the well-known Pieter Both. (Notes of heights, etc., are given in vol. ix. p. 261.) Isolated hills, ending in a conical shaft of rock, occur in many parts of the island, and are, no doubt, the cores of ancient volcanoes. There are also many craters still very perfect in form, some densely timbered, and others enclosing lakes, of which the best known are the Grand Bassin, the Bassin Blanc, and the Trou aux Cerfs. The Grand Bassin occupies a double crater, the ridge between the two forming an island, and it is about 650 yards long by 300 wide. The Bassin Blanc is circular and about 300 yards across. Both are very picturesque. There is no visible outlet from either crater, but the water filtrates through the porous lava, and finds its way to the surface again in springs. The volcanic fires are evidently not extinct, but only dormant, for slight earthquakes have frequently occurred, and there is an active volcano in Bourbon. Another striking feature of Mauritian scenery is the deep river gullies, eroded by the abundant rain that is precipitated, when the south-easterly trade-wind blows, on the steep flanks of the mountains. Thus the Tamarin river runs through a ravine 1160 feet in depth, and the Black river gorges are over 2000 feet deep. The lava flows contain many tunnels which have in some places given rise to curious phenomena. For instance, on the coast there is a remarkable blow-hole called the Souffleur, the sea rushing into a cavern and rising in a magnificent jet 60 to 70 feet high through a hole in the roof.

The geology of the island is very uniform, the greater part of the surface consisting of a volcanic breccia. Ths commonest rock is basalt, of which dolerite is the most abundant variety. The basalts contain a large proportion of magnetite, which is a great drawback to the surveyor, as the compass is useless in the neighbourhood of one of the mountain masses. There is evidence of variations of level and an elevation of the whole island in recent times, for masses of coral reef and beach coral rocks are found at elevations of from about 40 feet in the south to 12 feet in the north. But the most interesting feature in Mauritian geology is the existence of sedimentary rocks, in two places at least, at considerable elevations. In the Black River mountains, near the Chamarel road, at about 1200 feet about sea-level, a coarse clay-slate crops out among the volcanic rocks, covered with a different vegetation from that growing on the neighbouring slopes. The bedding appears to be approximately horizontal. Again, near Midlands, in the Grand Port mountains,

a crystalline chloritic schist forms the summit called La Selle, 1700 feet high, which stands up bare of trees amid a tropical forest. The strata, not less than 300 feet thick, are much contorted, and have a general dip to the south or south-east. The talus at the foot of the southern cliff contains coral, *Serpulæ*, and beach sand, showing that the hill once stood as an island in the sea.

AMERICA.

Lower California.—Little has been published regarding this country, and therefore the notes of M. Diguet, published in the *Tour du Monde*, No. 27, are very welcome. M. Diguet was chosen by the Museum of Natural History (Paris?) to make a scientific excursion through the country, for which he was well fitted, having spent three years at the mines of Boleo, near Santa Rosalia. Taking this town as his starting-point, he proceeded to Mulege, on the coast of the Gulf, and still farther south to La Purissima, on the Pacific slope. Again he crossed to the Gulf, passing the village of Commondu, whence a path leads up to the vast volcanic mass forming a kind of plateau in the sierra. Here a few craters, choked up with mud, retain the water for some time after the rainy sea, forming lagoons. This plateau abuts on the coast of the Gulf at the Cerro de la Giganta, at the foot of which lie plains extending to Loreto, the capital of Lower California at the time of the missions. This town is now entirely destroyed by earthquakes. To reach La Paz, M. Diguet chose the road crossing the sierra, and affording access to the plains stretching from the sierra to the ocean. At La Paz he found facilities for studying the marine fauna and visiting the various islands in the bay. To the south the flora is different, as the country lies on the Tropic. On his way to Todos Santos the explorer passed some days on the crest of the sierra, which is here densely wooded, and produces trees not found in other parts of the peninsula, such as oaks, pines and palms. The drought which had prevailed on the Pacific coast for five years prevented M. Diguet from returning northwards by this route, and he was obliged to return partly by the way he had come, partly by the plains on the Gulf.

Lower California is a narrow tongue of land, about 750 miles long by 75 broad, with a backbone formed by a prolongation of the mountain chain of Upper California. This range lies on the side of the peninsula towards the Gulf, leaving room on the western side for vast plains of small elevation. At the broadest part of the peninsula, between lat. 27° and 28° N., a few ridges run for some sixty miles parallel to the main chain. As regards the geological deposits, primitive rocks, consisting of more or less disintegrated granites, form the extremities of the peninsula, and attain an average elevation of 2600 to 3000 feet. A few peaks rise still higher, as, for instance, the Cerro de la Laguna in the south, which has an elevation of 5900 feet. The central part, lying between the granites, is of purely volcanic origin, and originated in two distinct systems of eruptions. There were eruptions of mud forming clays, sandstone, and conglomerates; and, secondly, outflows of volcanic rocks—lavas, basalt and trachyte—which now cover large tracts where, on the most elevated plateaus, are still to be seen huge extinct craters, partly filled up with mud. The only signs of activity still remaining are a few insignificant solfataras on the Cerro de las Virgines. The elevation of the volcanic districts of the sierra is nearly the same as that of the primitive rocks. The Cerro de las Virgines and the Cerro de la Giganta attain to greater heights.

The fauna is not rich is species, except among the small forms. The puma, lynx, and a very few other beasts of prey are found; the Mexican deer, a wild sheep that haunts the inaccessible summits of the sierra, and a kind of antelope living on

the plains of the Pacific coast are the only ruminants. Birds are very numerous, and so also are reptiles. As the streams are few, so also are the fresh-water fishes, but the Gulf of California is well stocked, and many of the fish grow to a very large size.

Though arid in many parts, the soil of Lower California is fertile, as appears where there is water on the surface. The fruit-trees which have been imported have become quickly acclimatised. Among them are dates, coco palms, oranges, figs, peaches, bananas, olives, and vines. Coffee, which has been recently introduced, thrives excellently. The date-tree, imported last century, has propagated itself without any cultivation. The flora of the country is to a great extent the same as in the neighbouring regions, particularly Arizona. In general, Lower California, especially the coasts, presents an arid and desolate appearance, but as soon as rain falls the ground is covered with vegetation.

The native races are almost extinct, and the present population, numbering thirty to forty thousand, are descendants of Spanish colonists or half-castes who have crossed from the opposite coast to work in the mines. Of these, the most important are the copper mines of Boleo, worked by a French company ; in the south are silver mines, and in the north, at Calamaki, mines of gold. Agriculture is pursued to a very small extent. Pearl fisheries are exploited.

Rainfall in Central America.—Professor Mark W. Harrington has reported on the rainfall of Central America in the *Bulletin of the Philosophical Society of Washington*. The best series of rainfall measurements are those for San José, Costa Rica, kept by Professor Pittier ; others have been recorded by Dr. Earl Flint on the western shore of Nicaragua, at Guatemala city, Belize, San Salvador, and elsewhere. There are three climatic zones ; the Tierra Caliente, extending from the coast up to an elevation of 300 or 400 feet, hot, marshy, damp, and unhealthy ; the second zone, extending up to 3500 feet, warm and moderately well watered ; the third, which with the former constitutes the Tierra Templada, the most thickly populated and most healthy part of the country, extends up to 7500 feet, and is cool and dry ; in the fourth zone, the Tierra Fria, the precipitation is small, and frosts are common. As a whole the rainfall is tropical, following the sun as it moves to the north or south of the Equator. As the maximum occurs when the sun is in the zenith, there are two rainy seasons separated by a long and a short interval. The long dry season is in winter and spring ; then there is a wet season from May to November, interrupted by the short dry season in August.

Professor Harrington has prepared a chart, from which it appears that the rainfall is greater on the Atlantic than on the Pacific side in the ratio of two or three to one ; that the maximum rainfall occurs at Greytown, where the total annual fall is over 20 feet ; and that the smallest is observed along the upper plateaus in Central America proper, but on the southern coast in the isthmus region. There are four types of rainfall. The first, found along the Pacific slope and on the plateaus of moderate elevation, has a maximum in June and October, scarcely any precipitation from November to April, and a secondary minimum in August. The second type prevails in the north-east ; it has maxima in June and October, but its rainy season extends to January, and there is no absolutely dry month. The third type, found on the southern half of the Atlantic coast, has no dry month, and has maxima in July, November, and January. The fourth type is transitional. Its long dry season is short (January to March), the maxima are in April and November, and the summer dry season is extended. This is the type of Southern Central America, on the Isthmus of Panama.—*Am. Meteor. Journ.*, July 1895.

The Salina Grande of Catamarca.—This salt pan, in the lowest part of the great sterile plain which occupies parts of the provinces of Cordoba, Santiago del Estero, Catamarca, and Rioja in the Argentine Republic, has always been painful, if not dangerous, to traverse, owing to the great heat and intense reflection from its white crystalline surface. Dr. Pompeyo Moneta, when engaged on a preliminary survey for the railway from Cordoba to Jujuy, came to the conclusion that, if a channel were made to draw off the water, the salt would be carried off with it, and the limits of the unprofitable area would soon be much restricted. With this end in view he noticed that the station of San Francisco on the Dean Funes and Chilecito line was 838 feet above sea-level, and that of Totoralejos, on the Cordoban Central Railway, 580 feet, and as the level of the salt pan is not much below the stations, the difference of level between these two points of the Salina may be taken at 258 feet. The distance is 84 miles, and hence the fall is about ·58 per 1000. The station of Loreto has an elevation of 458 feet, and the Rio Dulce may, in this neighbourhood, have an elevation of about 330 feet, and consequently the fall in the distance of 93 miles from Totoralejos is 250 feet, or about ·51 per 1000. This difference of level is not of itself sufficient to drain the plain, but would suffice for the purpose if a canal were constructed. With this scheme might be combined another which has already been the subject of several investigations. This is the deviation of the Rio Dulce, the people on the banks of the old channel being at the same time provided with water. Even in a country where land is plentiful the salina is of importance, for it has a length of about 300 miles, with a mean breadth of perhaps twenty-five miles, and therefore an area of some 7500 square miles.—*Cosmos*, vol. xii. No. 1.

OCEANIA.

Matty Island.—In vol. x. p. 97 the re-discovery of Tiger Island by Captain Dallmann was reported, and its identity with Matty Island. It was discovered in 1767 by Carteret; and Captain Bristow in 1817, led astray by a chronometer error, named it Tiger Island after his vessel, believing it to be a new island. In 1893 Herr L. Kärnbach, who accompanied Captain Dallmann, obtained a collection of ethnographical objects so peculiar and so different from anything found in the other islands of the New Guinea seas that they were considered worthy of a detailed description by Dr. F. von Luschan in the *Internationales Archiv für Ethnographie*, Bd. viii. Heft 2. A more popular account is given by the same author in the *Verh. der Gesells. für Erdkunde zu Berlin*, Bd. xxii. No. 6.

Dr. Luschan first classifies the peoples of Oceania and defines their habitats. New Guinea and the neighbouring islands to the north-east, particularly the Bismarck Archipelago and the Admiralty group, must be considered as the centre of that family which was formerly known as the Papuan, but is now sharply distinguished as West Melanesians from the East Melanesians with whom they were formerly confounded. Both groups contain men who from their dark skin and woolly hair are easily mistaken for Negroes, even by persons well acquainted with the latter. But the East Melanesian type, which has its centre in the Fiji Islands, is differentiated unmistakably from the West Melanesian by its very long, high, and narrow skull. Both are, however, of a negroid type, and contrast strongly with the lighter-coloured, straight-haired Polynesians of the South Seas, who are of Malay race. Between the two some ethnologists have placed a Micronesian race, but such does not exist. There is, however, another element—the people of New Holland—with dark skin, smooth hair, and a peculiar form of skull. They have spread over the Australian continent and New Zealand, and are found more or less on many other islands of the Pacific, even as far as Easter Island.

Of these four elements the mass of the present population of Oceania is composed. Of the wanderings of these peoples nothing is known except in the case of the Polynesians, in whose traditions even the names of the men who first landed on a given island are mentioned. Herr W. Volz, after prolonged investigations, has arrived at the conclusion that the western part of the South Seas was originally inhabited by people of the New Holland race, that afterwards the East, and still later the West, Melanesians migrated thither from somewhere in the Malay Archipelago, driving the New Hollanders before them; and that lastly the Polynesians, coming from the same direction, settled first in Samoa and Tonga, and afterwards in Tahiti, whence by numerous journeys, and perhaps in part about four to six centuries ago, reached their present abodes. For several centuries past the population, with some few exceptions, has been stationary, and in each group of islands has acquired a particular character. It might, therefore, be expected that Matty would have a negroid population resembling that of the neighbouring New Guinea. But Herr Kärnbach describes them as light-coloured and smooth-haired. He could not understand a word of their language, and of the thirty-seven articles he obtained, none, except an insignificant piece of string, has any resemblance to the manufactured products of New Guinea. Nay, more, many of them are quite unique and not to be matched anywhere in the world. Such are a club armed with a triangular piece of the carapace of a turtle, low rectangular wooden bowls cut out of one piece, helmet-like head-dresses, and axes with heads of tortoiseshell most artistically fastened on to the haft. Certainly the people are not Melanesians, and are probably of purer race than the inhabitants of other Oceanic islands, and therefore an ethnological study of this island is likely to furnish data for the solution of many dark problems connected with the ethnography of Micronesia and the relation of its inhabitants to the other peoples of the South Seas.

The Marshall Islands.—News from these islands rarely finds its way into European publications, their area being small, and their trade and general importance consequently small. Dr. Erwin Steinbach's description in the *Verh. der Gesells. für Erdkunde zu Berlin*, Bd. xxii. No. 6, contains, therefore, much that will be new to most readers. He had an opportunity of gaining full information about them during the years 1891 to 1894, when he was physician to the German administration. The group consists, as stated in vol. iii. p. 207, of low islands arranged in two parallel chains running from north-north-west to south-south-east, called, respectively, Ratak and Rälik, or the islands towards sunrise and sunset. They extend over an area bounded by the parallels of 4° and 15° N. lat. and the meridians of 161° and 173° E. long. Within this large area lie thirty-four islands, with an aggregate area estimated by some authorities at 110 square miles, and by others at nearly 770. Dr. Steinbach believes 175 miles to be the correct area. The German man-of-war *Möwe* is shortly to be engaged in making a survey of the islands. All the islands are of coral, most of them in the form of atolls. The dimensions of these atolls are very varied, the Lai atoll having a diameter of only 4 to 5 nautical miles, while that of Kwajelin is more than 60 miles long by 20 broad in some parts. So also the number and size of the islands on the encircling reefs differ considerably; the atoll Namrik has but two, while others have sixty to eighty.

The most important atoll of the Rälik chain is Yaluit. It lies in 5° 55′ N. lat. and 169° 43′ E. lat., and has a length of some 27 nautical miles, and a breadth of 17. Its native population numbers about 1100. On the island of Yabwor, on the south-east passage, are the seat of the government and the headquarters of the Yaluit Company. The harbour is one of the finest in the world, and can shelter

large fleets from winds of almost all quarters. Ebon and Namrik are the other chief atolls of the Rälik chain. The former, the most southern of the Marshall Islands, is remarkable for possessing a fairly thick layer of vegetable soil, and a rich vegetation of coco-palms, bread-fruit, bananas, and *Pandanus*. Namrik is almost closed to the sea, and its lagoon can only be entered by small boats at high tide. Pearl shells are found, but not in sufficient quantities to reward the fisherman. Of the eastern chain, Ratak, the largest atoll is Mejeru, with a large population of 1200 souls. Arno, separated from Mejeru by a narrow canal, is also populous, its fruitful soil supporting more than 1000 persons.

The climate of the group is fairly endurable by Europeans, though tropical in character. The reason is that owing to the permeability of the coral subsoil the water runs off immediately, and cannot form marshes for malaria to breed in. The mean annual temperature in Yaluit during the three years of Dr. Steinbach's stay was 80½° F., and the mean range only 22·7° ; the mean daily range was 12·2°. The highest absolute temperature observed was 92·8°, and the lowest 70·7°. The difference of the temperatures of the hottest month (January or February) and of the coldest (July or September) was not more than 1·4° or 1·6° F. So also the atmospheric pressure, humidity, and rainfall show little variation. The mean pressure in 1893-94 in Yaluit was 29·85 inches, and the range during the year was only ·25 inch. The relative humidity is very high, being on an average 83 per cent., but varies only from about 74 to 89 per cent. The rainfall is nearly equally distributed throughout the year, January and February only being comparatively dry. The quantity of rain, about 180 inches annually, is very large for low-lying islands in the middle of the Pacific. The cloudiness is also great, and there were only six really bright days in 1893. The winds are almost exclusively easterly, the north-east trade-wind blowing from December to April, and east and south-east winds prevailing during the rest of the year. In August and November these are sometimes interrupted by calms and violent south-westerly storms.

There is no spring water on the islands, but the natives collect very palatable water in ditches, and the Europeans catch the rain-water from their roofs. The abundant rainfall promotes a luxuriant growth of vegetation. The flora is in general character that of the Indian monsoon region. Dr. Steinbach counted more than 100 varieties, and there are probably still more. Recently introduced forms, such as the *Carica papaya* and castor-oil plant, spread rapidly. The grasses are poor and yield but a meagre nourishment to the cattle that have been imported. The fauna is also poor in variety, but numerous in individuals. A rat and mouse are the only mammals. The land birds are confined to a pigeon, the widely distributed *Carpophaga oceanica*, and a cuckoo ; water birds are more numerous. The sea fauna is as rich as the land fauna is poor. Formerly the sperm whale was caught between the Gilbert and Marshall Islands by American whalers, and a small whale, probably a *Globicephalus*, occasionally finds its way into the lagoons. The coral reefs swarm with bright coloured fish and *Crustacea*.

The racial affinities of the Marshall islanders have been the subject of much discussion. Dr. Steinbach affirms that they cannot be distinguished from natives of the Central Caroline Islands—Ponape, for instance. They are well-built, slim, and thin, with well-developed muscles. The colour of the skin varies from dirty yellow to a dark chocolate tint. Their features are regular, and indicate a high degree of intelligence. They rarely indulge in intoxicating drinks, but are passionately fond of tobacco. It is a singular fact that they never eat salt. Tattooing is common, and ornaments—wreaths of flowers and ferns, chains of shells, coco-nut and tortoise-shell—are much worn. The houses are rectangular, and consist of a roof sloping down on either side from a pointed ridge of *pandanus* leaves.

The Marshall islanders are skilful canoe-builders, and make fishing-nets of palm leaves, and tough rope from coco-nut fibres. Perhaps their most remarkable production is a kind of map, called a *medo*, an arrangement of small sticks, some indicating the directions of certain stars at certain seasons, others marking currents and swells. The character of these natives is mild and phlegmatic, but they are sometimes malicious and treacherous. Theft is now seldom heard of, but of truthfulness the Marshall islanders have no notion. They have learnt the advantage to be derived from growing coco-nuts and selling *copra*, and trade with money. They do not appear to be dying out, if, indeed, their numbers are not increasing.

GENERAL.

The Distribution of Storms.— In *Ciel et Terre*, August 16th, M. A. Klossovsky publishes a map showing the distribution of storms throughout the world, and gives a general review of the various zones of electrical activity. One of great intensity extends on both sides of the Equator, where rains are most abundant. On the whole, the areas of disruptive activity spread out from the north-west to the south-east over each continent, forming three electric divisions. The first equatorial zone, that of Asia and Oceania, extends from the Himalayas to New Guinea, and within its limits the number of storms in the year averages 90 to 100 or even more (118·6 at Palembang). Another continental zone extends from the western coast of Africa between 5° and 10° N. lat. to 10° or 15° S. lat. The number of storms is 200 at Bismarckburg, 66 at the Gabun, and 95 at Vivi, on the Congo. Probably this tropical zone extends south-eastwards to the eastern coast, 94 storms occurring at Kakoma, and 46 at Zanzibar. The eastern coast of Southern Africa has more storms than the western. The third continental storm area is situated in the tropical regions of the New World, extending from about 20° or 22° N. lat., in Mexico, to the parallel of 25° S. lat. The average in Mexico City is 138·5, and in Leon 141. At Lima no storms occur.

Beyond these equatorial zones, in the deserts of Africa, in Arabia, Syria, Persia, and Central Asia, storms are rare. Northwards the electric force increases in strength. Through the whole of Central and Southern Europe, from the Atlantic to the Ural mountains, the average number of storms varies from 15 to 20, and attains locally to 30 and 40, in the south-west of Italy for instance. At the extreme north-west of Scandinavia it sinks below 1, but increases south-eastwards till it rises to 5 on the line between Bergen and Kola. The zone of 5 to 10 includes the British Isles and the north of Russia.

In North America the Eastern States have 20 to 30 storms annually, and Toronto has 29; but these disturbances are less frequent along the Atlantic Coast (at New Brunswick only 9·3). In Alaska (63° 28′ N. lat.) there are only 3 to 4 in the year, and at Fort Simpson 3 have been recorded in three years. In the same latitudes of the Old World there is much greater electrical energy, the numbers being 9·9 for Beresoff, 8·1 for Turukhansk, and 15 for Sodankyla. This circumstance is probably connected with the fact that the circle of the Aurora Borealis extends farther south in the New World than in the Old.

For the high latitudes of the southern hemisphere there are no data, except for the Falkland Isles, where the annual total of storms is 3·9.

The Annual Variation of Temperature of Ocean Water.—Dr. Gerhard Schott has compiled a chart of the annual variations of temperature, which he has published in *Petermanns Mitt.*, Bd. xli. No. 7, accompanied by explanatory text. His data are drawn from all the latest observations, and the sources from which he has obtained them are recorded in the first section of his paper. The annual range, he

finds, nowhere stands in direct relation to the latitude. Near the Equator very small, and also very considerable, variations occur, as well as in higher latitudes. If certain seas more or less shut off from the ocean or much exposed to continental influences be left out of account, the annual range is found to vary from less than 1° C. (1·8° F.) to about 15° C. (27° F.). The general law governing the geographical distribution of the mean yearly range is that its amplitude in every ocean increases from the Equator towards the Poles up to 30° or 40° of latitude, beyond which it decidedly diminishes. In this it corresponds closely with the distribution of atmospheric pressure and salinity, and hence Dr. Schott's map exhibits great similarity to Hann's pressure chart in Berghaus' *Atlas*; but it must not be inferred therefrom that there is a similarity in the yearly course of these phenomena, for, indeed, the opposite is rather the case. The greatest variations of temperature occur in the tropical calms belt, and are more considerable in the northern than in the southern hemisphere. Near the Azores the annual range amounts to 14° or 16° F., and in the northern Pacific to 21°, while in southern latitudes it never exceeds 14°. The positions of the maxima are no doubt due to the change in the sun's altitude, feeble winds, and a relatively clear sky. Towards the Equator, and still more towards the Poles, there is a considerable increase in cloudiness and in the velocity of the wind, and hence the yearly range decreases. As, also, the sun changes its altitude but slightly within the Tropics, this diminution is greater towards the Equator than towards the Poles.

In all three oceans there are areas near the Equator where the range does not amount to as much as 1° C. (1·8° F.), while the minima in high latitudes are hardly below 3·6° F. The regions of least range, which are very small in the Atlantic but large in the Indian and Pacific oceans, occur where the Guinea stream in the first, the Indian counter-current and the monsoon drift in the latter oceans, take their rise, that is, near the belt of equatorial calms, where the favourable conditions of cloudiness, abundant rains, and uniformly high temperature prevail.

Towards the Poles strong winds and abundant rain in all seasons counteract the effects of considerable differences in the altitude of the sun, so that at Cape Horn, in the southern oceanic hemisphere, for instance, and Kerguelen, ranges of about 2° C. are found, while in the North Atlantic they amount to 4° or 5° C. (7° to 9° F.), and in the North Pacific to $14\frac{1}{2}$° F. The last ocean, therefore, shows in this, as in many other respects, the most continental character.

Another important point with regard to the variations of temperature is the character of the sea basin. Seas more or less enclosed are subject to the climatic influence of the adjoining continent. This effect is seen on the chart in the case of the Mediterranean and Black Seas, and still more clearly in the Sea of Okhotsk, where the contours of equal range follow the curves of the coast, and hence indicate a gradual diminution of the influence of the continent towards the open ocean.

Where currents of considerable volume flow throughout the year without any important change of velocity, the variation of temperature will, *ceteris paribus*, be found to be small. Such is the case in the West Indian waters and in the Agulhas and Brazilian currents. The contrary happens when great changes take place in the currents at certain seasons of the year, as in the neighbourhood of Newfoundland and in the East Asiatic waters, especially at the meeting-point of the Kuro and Oya Shiwos, where the range is as much as 36° F.

The North Pacific is the most remarkable for areas both of large and small annual ranges. Nowhere else are the areas of ranges of 18° F. and upwards so large as in the northern and western parts of this ocean, or the areas of small variations as large as in its tropical part. The seas of the southern hemisphere are much alike; the range reaches its maximum of 9° to $13\frac{1}{2}$° between lat. 30° and 40°

and then diminishes towards the Pole. The Indian Ocean is peculiar in this as in other hydrographical features. Great changes do not occur in it, as the currents are essentially different from those of the other oceans.

A comparison of the eastern and western sides of the oceans shows that in middle and higher southern latitudes the range is about the same, that in the Tropics the eastern side, off the west coasts of America and Africa, is subject to greater variations, while farther north the position is again reversed. These results agree with those of Dr. Supan for the range of air temperature on the continents (*Zeitschrift für Wissenschaftliche Geographie*, 1880) as far as a comparison can be instituted between them.

It is well known that the sea attains its extremes of temperature later than the land, and it is found that the maximum is nowhere attained in July, but in August or September—in some parts even as late as October—while the minimum occurs in February and March. The same months are those of the extreme temperatures in the waters of the southern hemisphere, the maxima, of course, occurring contemporaneously with the minima in the northern hemisphere.

MISCELLANEOUS.

Mr. J. G. Goodchild, of H.M. Geological Survey, will deliver four courses of lectures on **Physical Geography and Geology**, at St. Margaret's College, East Suffolk Road, on Tuesday and Friday evenings, commencing on October 1st.

After the *Pola* has completed the investigation of the Eastern Mediterranean it will be sent to the **Red Sea**. The northern part, as far southwards as Jeddah, will be the scene of its work in the winter of 1895-96.—*Petermanns Mitt.* Bd. xli. No. 8.

On Sept. 14th the *Kite* arrived at St. John's, Newfoundland, with **Lieut. Peary** and his two companions. They were reduced to great extremities when found by the crew of the vessel. Visits were paid by the steamer to Jones Sound, Cape Sabine, and Littleton Island.

The preliminary arrangements for a central railway through **German East Africa** seem to be progressing more rapidly. The first section is to run from Dar-es-Salaam to Ukami, and ultimately, when the difficulties of crossing the mountains have been overcome, the line will be prolonged to Tabora and Tanganika.—*Deutsche Kolonialzeitung*, No. 34.

Lieutenant Pike, accompanied by Herr Kroemer, who has hunted in the northern regions, was to leave Tromsö last month on a **Polar expedition**. His intention is to winter in Spitzbergen and then pass over to Franz Josef Land, where he will wait for a favourable opportunity of proceeding northwards with sledges.—*Le Mouvement Géographique*, August 4th.

Waterways are the chief means of transport in **Russia**. Its rivers and canals have an aggregate length of about 34,000 square miles, while the rest of Europe contains only 28,000. The average traffic is more than 19½ million tons, according to official statistics, and this figure is no doubt far below the correct one. Russia possesses 1300 river steamers and 21,000 boats. Nevertheless Russia cannot compare with the United States, where the river and canal traffic amounts to over 58 million tons.—*Le Mouvement Géographique*, August 4th.

A canal is to be made in Russia between the **Baltic and Black Seas**, 990 miles in length. From Riga it will follow the courses of the Dwina, Beresina, and Dnieper,

entering the Black Sea near Kherson. Five years is the time allowed for its construction, and the cost is estimated at about 24 millions sterling, a very small proportional amount compared to that expended on similar undertakings elsewhere, the difficulties to be overcome being insignificant. The sectional measurements will approximate to those of the Baltic and North Sea Canal.—*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxviii. Nos. 5 and 6.

M. A. Lancaster of the Uccle Observatory has written a work entitled La Pluie en Belgique, published by the Geological Society of Belgium. *Symons's Monthly Meteor. Mag.* for August gives the principal characteristics of the distribution according to this work. Over the north and west of the country the rainfall is between 20 and 30 inches, and from 30 to 40 inches in the Ardennes, The maxima occur a few miles to the south-east of Verviers, where, at Hockai, 1762 feet above sea-level, the mean rainfall is 52·36 inches, and at Paliseul, in the Ardennes, at an altitude of 1348 feet, which has a fall of 48·03 inches. M. Lancaster notices the curious anomaly that, while in the British Isles the western shores are the wettest, the reverse is the case in Belgium.

NEW BOOKS.

The Great Frozen Land: Narrative of a Winter Journey across the Tundras, and a Sojourn among the Samoyads. By Fred. George Jackson, F.R.G.S., leader of the Jackson-Harmsworth Polar Expedition. Edited from his Journals by Arthur Montefiore. London: Macmillan and Co., 1895. With 46 Illustrations and 3 Maps. Pp. xviii + 297. *Price* 15*s. net.*

In order to test by personal experiment what was the most suitable food, clothing, and equipment for his projected Arctic expedition, Mr. Jackson was landed by Captain Wiggins, in the autumn of 1893, at Khabarova, a small settlement on the mainland, immediately south of Waigatz Island. On leaving England he had hoped to visit the interior of the southernmost island of Novaia Zemlia and also the Yalmal Peninsula lying farther to the east, but he was unable to induce the Samoyedes to take him there. He would have been more likely, we imagine, judging from Dr. O. Finsch's expedition, to have attained the latter object by making Obdorsk the base of his operations. However, he crossed with two Samoyedes the narrow strait to Waigatz, explored the interior by sleighing round the island, and thus was able to correct the map and the Admiralty chart in several particulars. A silk tent, specially guaranteed by its maker, proved a complete failure on this preliminary expedition. On the 11th of October he started with a caravan of Samoyedes and Russians from Khabarova, and drove along the whole northern coast of Russia in Europe as far as the Varanger Fiord, an interval of no less than 30° of longitude. In two or three places between his starting-point and the mouth of the Pechora he noted the existence of old sea-beaches, though of recent origin, that do not appear to have been observed before. In the course of this long journey he was able to compare the sleighs and articles of clothing used by the Samoyedes with those of the Lapps, and found the former in every way preferable. The Lapps, too, are described as more agreeable to deal with, and possessed of far better manners than the Russian peasants that occupy the same region. A protracted journey in winter, such as that undertaken by Mr. Jackson, was naturally an extremely arduous one. It was of a nature to test his

physical endurance, his self-reliance, and his temper to the utmost. The record of his expedition shows that he bore himself bravely, and that he is of the right stuff for an Arctic explorer.

Mr. Jackson's sanguine nature—so necessary in an explorer—peeps out when he tells us that before leaving home he hoped "to understand the Samoyede code of morality, something of the motives by which they were swayed, and to learn their sense of a higher influence" in about four months' time, and without being able to converse with them in any language. Such matters can, of course, only be learnt after long social intercourse with the people, and with a very exact knowledge of their language, and it would be unfair to expect to acquire any knowledge of this recondite sort from a passing traveller. Indeed, he tells us nothing new about the Samoyedes unless it be their way of breaking in reindeer.

The weak point of the volume, for which the editor is mainly reliable, is the notes, most of which might have been omitted, not only on account of their length, but also, in some instances, of their erroneous contents. The seventh chapter, which gives an unsatisfactory description of the Samoyede language, and a list of words collected by Mr. Jackson, might also have been kept back. The list contains far too many doubtful forms to be accepted as it stands. His untrained ear does not always distinguish between an open *ô* and *or*, between *-a* and *-ar*. He writes *salabar* for *salaba*, *puther* for *puda* or *pudha*; *gurr* for *gur* (butter)—*gurr* means "thy butter." In *hortin* "boots," the *r* is superfluous, and the *n* seems to be the attributive suffix of the 2nd person singular. *Raroisé* "a foot" is certainly wrong, as no word can begin with *r*.

In Appendix A a list is given of the 58 kinds of birds secured by Mr. Jackson for his natural history collection. Appendix B contains weather observations between September 1st, 1893, and January 26th, 1894.

A Vagabond in Spain. By C. Bogue Luffmann. London: John Murray, 1895. Pp. xv+345.

To tramp across Spain, from San Sebastian to Malaga, in the character of an ordinary vagrant, is not an undertaking that sounds attractive. Yet this is what Mr. Luffmann did in the year 1893; and now recounts his experiences in the book under review. "I did not act the character," he observes; "I lived the life in real earnest. The vagrant's rest-house was my only hotel; the succour doled out by the alcalde my only means of sustenance." But he adds that this *rôle* was discarded in the larger cities, where he lived like other travellers at his own charges. The object of this unconventional expedition was that of "getting a practical knowledge of the condition of agriculture in Spain, and of learning to understand the life and social conditions of the common people."

In order to carry out this plan with any measure of success, one would think that a knowledge of Spanish was essential. Mr. Luffmann, however, frankly confesses his ignorance of the language at the outset, and in spite of his close contact with the common people, he appears to have displayed a singular inability to master their speech. At Pamplona he could only answer "Si, si," to a remark of one of the local maidens, and even towards the end of his journey he calls a tavern a "ventas." This, be it noted, is by no means a solitary error. One is apt to wonder how he was able to translate, even "roughly," the song given at p. 207; and at "Don Luis' Song" (pp. 208-9) one becomes a hardened sceptic.

Under such conditions a tramp in Spain is unlikely to yield a sufficient return of pleasure or of information to compensate for its inevitable discomforts. Much of the book is little else than a record of sordid experiences. On the other hand, Mr. Luffmann observed things keenly as he went along, and several of his

statements are decidedly interesting. The following description (p. 138) of a certain unusual type of Spaniard is both graphic and valuable :—

"The feast of San Lorenzo brought visitors from all parts. Not only holiday-makers from Madrid, but half-wild, half-naked, and strangely-clad men and women from the mountain districts. These peasants have the lowest type of head I have seen in Spain. They have round, pudgy faces, full mouths, and lips that curl back, exposing prominent, narrow, animal-like teeth. The cheek-bones are high, the eyes small and dull, the forehead narrow, and slanting back to the crown of a sugar-loaf head. As the men slouch along they look like ugly bundles of flannel and leather straps. The women are all head and hips. They turn their toes inward, as if from continually climbing hills."

It must be remembered, moreover, that Mr. Luffmann excludes from this book the result of his "practical researches," and it would therefore be quite an error to assume that the pages of "A Vagabond in Spain" give anything more than a partial account of the author's investigations. But the pilgrimage itself was manifestly a weariness to the pilgrim, and holds out little inducement to any one to follow in his steps.

Vikings of To-day; or, Life and Medical Work among the Fishermen of Labrador. By Wilfred T. Grenfell, M.R.C.S.E., L.R.C.P. Illustrated from original photographs. London: Marshall Bros., 1895. Pp. xvi + 240. *Price* 3*s.* 6*d.*

Mr. Grenfell gives us in this book an account of the voyages he made to Labrador in 1892 and 1893 as a medical missionary. It opens with a description of the country, its fauna, flora, and its inhabitants, consisting of Indians, Eskimo, and Newfoundland fishermen. Some very interesting chapters deal with the catching of the codfish and the seal; the killing of the latter, it is gratifying to note, is generally done without cruelty. We also get original information on the Eskimo. The fact that any of them remain in Labrador is entirely due to the Moravian mission; but it is sad to learn that the people are fast losing their old art, *i.e.* kayaking. The author has much to say about the frightful misery and suffering among the Newfoundland fishermen on those inhospitable shores—the Vikings of to-day—but he also tells many a noble deed of heroic self-sacrifice. The social condition, owing to the disgraceful truck system and the absence of all authority residing permanently in the country, is truly appalling. Most readers will say that life is not worth living there. Evidently, however, the inhabitants think otherwise; but Mr. Grenfell is assuredly right in insisting that the Newfoundland Government should take steps to improve matters. In the meantime, the Society which sent him out is doing excellent work, and this work appears to be highly appreciated. Mr. Grenfell's graphic account will, we hope, materially aid in furthering the cause which he so nobly serves.

Five Years in Canada. By W. M. Elkington. London: Whittaker and Co.; Rugby: Geo. E. Over, 1895. Pp. 138. *Price* 2*s.* 6*d. net.*

In *Five Years in Canada* a young Englishman narrates his experience of farm and ranch life in Canada. The little book, which reads like a diary, gives a very vivid, and no doubt truthful, account of his daily life during an apprenticeship of eleven months, which he served with a farmer, and the next four years, when he was farming and ranching on his own account. We read a good deal about mosquitoes, blizzards, prairie-fires, and the hardships of a bachelor who is compelled to be his own housekeeper, cook, etc. Life such as the author led means certainly "roughing it"—plenty of hard work and very few social pleasures; but to a young fellow with a sound constitution it is a healthy life. Young men

intending to emigrate to Canada will do well to read the book, as it will enable them to form an accurate idea of the kind of life that is in store for them. At the end of the book Mr. Elkington gives practical hints to different classes of emigrants and useful statistics as to outlay and return in farming and ranching.

Sport on the Pamirs and Turkistan Steppes. By Major C. S. Cumberland. With Frontispiece, Map, and Index. Edinburgh: William Blackwood and Sons, 1895. Pp. 274.

Major Cumberland's object in visiting the wild regions he so graphically describes was to shoot the *Ovis Poli*, or Marco Polo's wild sheep, the red-deer of Turkistan, and other game; and in this he was very successful.

He started from Kashmir in 1889, and passing through Yarkand and Aksu, reached the neighbourhood of the Baghrash Kul, whence he retraced his steps to the Aksu, and then found his way by Kashgar and Marghilan to Samarkand, returning to England by way of the Caspian and the Black Seas. He gives a vivid picture of the country he passed through and of its inhabitants, and tells most exciting tales of sporting successes and failures. He came across many Russian and Chinese officials, by whom he was always treated with great kindness and courtesy; and his relations with the people were, generally speaking, most friendly. He did not either shoot or see alive one of the "wild" camels; but he does not consider them to be of a truly wild breed, believing rather that they are the descendants of domesticated animals originally brought from China. Local tradition and the varied colour of the camels now running wild on the Gobi Steppe both seem to point to this conclusion.

Au Congo: Comment les Noirs travaillent. Par le Lieutenant Lemaire (Ch.). Bruxelles: Imprimerie Scientifique, 1895. Pp. 139.

As its sub-title partly indicates, Lieutenant Lemaire's brochure deals with the natives of the Congo region rather than with its more strictly geographical features. The author's main argument, based upon his own personal experience and sustained by many quotations from other writers, is that the black races have been and are unreasonably despised by the Whites, and that, in those places where European civilisation has not affected them, they show themselves to be highly capable men. It may be that M. Lemaire places too high a value on the Negro, but his generous contention is advocated with much ability. The numerous clever illustrations by Lieutenant Masui are extremely interesting; and a number of excellent photographs are also reproduced.

Nord-Kamerun. Schilderung der im Auftrage des Auswärtigen Amtes zur Erschliessung des nördlichen Hinterlandes von Kamerun während der Jahre 1886-1892 unternommenen Reisen. Von Eugen Zintgraff. Berlin: Verlag von Gebrüder Paetel, 1895. Pp. ix+468.

The descriptions in this book are partly collected from the *Mitt. aus den Deutschen Schutzgebieten* and other periodicals, and the work of Dr. Zintgraff has from time to time been noticed in the *Scottish Geographical Magazine*, especially his journey from Cameroons to the Benue at Ibi and back from Yola. It was he who founded Baliburg, and in this work a full account is given of the circumstances attending the erection of the station and of the Bali people. In the later chapters the causes that led to the withdrawal of Dr. Zintgraff from service in the colony are briefly alluded to. Of this question we are unable to judge, but may express our regret that so noted a pioneer of civilisation should be lost to Africa.

The book is provided with a good map of North Cameroons and is adorned with several clear illustrations.

Vedic India, as embodied principally in the Rig-Veda. By Zénaïde A. Ragozin, Member of the Royal Asiatic Society of Great Britain and Ireland, etc. etc.; Author of "The Story of Chaldæa," "The Story of Assyria," "The Story of Media, Babylon, and Persia," etc. London: T. Fisher Unwin, Paternoster Square. New York: G. P. Putnam's Sons, MDCCCXCV. Pp. xii + 457. *Price* 5*s.*

Mr. Ragozin has contributed to the series of "The Story of the Nations" a painstaking, sympathetic, and scholarly survey of the Rig-Veda, and shown what it indirectly reveals to the historical inquirer. For the history of India before the Aryan invasion there are no data. We can only draw a few probable inferences as to preceding times from what is found to exist in the present day. Nor are there any materials for a history of the Aryan conquest; for many ages passed after the Aryans had become the dominant power in the peninsula before any attempts were made to chronicle events. But to the persevering efforts of sympathetic and thoughtful students the Rig-Veda has indirectly yielded much which throws light on the character of the invading race, their social conditions, general culture, religious beliefs, attitude to nature, and relations with the peoples with whom they came into contact and conflict, and whom they largely absorbed, but in absorbing were themselves profoundly transformed. Mr. Ragozin has used this light to good purpose. The picture he gives is based on a careful study of the best authorities, displays a wide acquaintance with the literature on the subject, and is characterised by sound judgment in the conclusions arrived at. There is not in English any work of a popular character from which a more satisfying and more lucid account is to be obtained of the contents and spirit of the earliest expression of the thoughts and emotions of the Aryan race. He has brought out with a skilful hand the meaning of the hymns as elucidated by the researches of many scholars, and has made them both intelligible and interesting to readers who without such a guide find the Vedic Mythology to be a tangled, pathless jungle. The opening chapter, which is devoted to a general description of the country, its physical features and productions, is less satisfactory than the rest of the work. The style is rather inflated and diffuse. The author has looked at the "Wonderland of the East" through the eyes of dreaming poets, whose descriptions represent what they think it must be rather than the prosaic reality, and occasional slight inaccuracies show that the writer is dependent on the accounts of others and does not give the results of personal observation. Still, conceived in a spirit of enthusiastic admiration, it is in harmony with the tone of the Vedic poets, whose works are the principal subject, and it forms a not ineffective prelude to the admirable analysis which follows. We cannot understand why the author, writing for English readers, has thought it necessary to write "Tchenab" and "Djumna," instead of the familiar "Chenab" and "Jumna," which are both correct English and exact reproductions of the originals. The collocation of letters necessary, perhaps, to a Russian, is an irritating disfigurement to an English reader. Similarly, "Panjâb" always appears as "Penjab," which can never to an Englishman suggest the correct pronunciation, and does not represent the Indian.

Glimpses of the Eastern Archipelago: Ethnographical, Geographical, Historical. Translated from the Dutch by Geo. G. Batten. Pp. 137.

The collection of papers in this pamphlet are taken from the *Indische Gids* and other periodicals, and are therefore of a fragmentary character. The translation brings, however, a certain amount of information concerning the Eastern Archipelago and its inhabitants within reach of those readers who are ignorant of the Dutch language.

Daendels—Raffles: A Dissertation on the two Celebrated Governors of Java. By M. L. VAN DEVENTER. Translated from the *Indische Gids* by GEO. G. BATTEN. London: E. Marlborough and Co., N.D. Pp. 128.

The reader will obtain from this work a general knowledge of the administration of Java during the changeful times of the Napoleonic wars. It cannot be said, however, that the author, Van Deventer, judges the measures of the two governors impartially. The administration of Daendels is generally admitted to have been unsuccessful, and his dealings with the native chiefs injudicious. But some allowance should be made for the difficulties of the times and his want of experience in colonial government. As to Raffles, the fact that some of his most important measures have been retained by the Dutch Government to the present day shows that they were not without merit, as, indeed, the author admits. When he blames Raffles for the defects of his land system, he is evidently ignorant that he simply transferred to Java the village settlement system in force in Bengal. A more equal distribution of rent could only be arranged after a thorough survey. During the short time he was in power, Raffles could not be expected to thoroughly remould the whole administration, or establish British authority over the whole Malay Archipelago.

Mr. Batten's translation places before English readers the judgment of an author who was of some note as a historian, and who looked at East Indian affairs from a non-British standpoint.

Bogen und Pfeil in Central-Brasilien. Ethnographische Studie von Dr. HERRMANN MEYER. Leipzig: Druck vom Bibliographischen Institut, N.D. Pp. vi + 54.

The interest attaching to this admirable pamphlet of Dr. Meyer's is more of an ethnographical than of a geographical character. The work is a close and careful study of the many varieties of bows and arrows used by the Indians of Central Brazil, illustrated by means of four plates showing in detail the characteristic features of these various weapons. Their classification into groups is denoted on the accompanying map. Although Dr. Meyer's work is the outcome of his researches in many of the museums of Europe, he modestly refers to the chances of inaccuracy, due to his limited scope, as well as to the carelessness of travellers and collectors. Nevertheless, his pamphlet is an excellent specimen of the kind of work daily turned out by patient investigators into every branch of science, notably in Germany.

Anthropogeographische Beiträge. Zur Gebirgskunde, vorzüglich Beobachtungen über Hohengrenzen und Hohengürtel. Herausgegeben im Auftrage des Vereins für Erkunde und der Carl Ritter-Stiftung zu Leipzig. Von FRIEDRICH RATZEL. Mit zehn Karten und zahlreichen Illustrationen. Leipzig: Verlag von Duncker u. Humblot, 1895. Pp. 362.

Professor Ratzel is such a well-known and voluminous writer, that on taking up this volume we thought it was a new work from his pen. This is, however, not the case, as it appears to be a collection of five papers or theses written probably by very advanced students of his own. The volume contains a paper on the density of the population in Saxony by Dr. Richard Buschick; a paper on the density of the population in West Central Africa by Dr. A. Vierkandt; a paper by Dr. A. F. J. Bargmann on the most recent detritus of the northern limestone Alps in its relation to the mountains, snow, water, plants, and man; a paper by Dr. M. Fritzsche on vertical limits in the Ortler Alps; and, finally, a dissertation on the

zones on Etna by Dr. Paul Hupfer. All the papers are characterised by thoroughness, by considerable erudition and painstaking research, and give a fair idea of the way in which geographical details are worked out on the Continent, and form a marked contrast to the generalisations to which we in this country are more accustomed. It is not easy to say which is the best. They are all worthy of study by technical geographers, and the two first papers by statisticians. We are of opinion that the density of the population in West Central Africa is of extreme value, but few people seem to realise its importance, although probably, as we appear to be embarking upon railway construction in that region, more attention will be paid to this problem now than heretofore. Finally, we may remark that this volume illustrates very graphically the advantage which Continental students possess over British ones, for there earnest students are aided in their endeavours by funds which enable them to publish the results of their researches. The maps are admirable. We wish, however, that Continental books were properly bound.

Petrology for Students: An Introduction to the Study of Rocks under the Microscope. By Alfred Harker, M.A., F.G.S. (Cambridge Natural Science Manuals.) Cambridge: University Press, 1895. Pp. viii + 306. *Price* 7*s.* 6*d.*

At the present day the study of petrology has become so important a branch of geological science that few workers amongst the older rock of the British Isles can any longer afford to remain ignorant of at least such rudiments of petrological knowledge as may enable him to refer any rocks he may find to somewhere near their correct position in the petrological scale. In the class-room, where he is carefully trained to recognise typical examples of each kind of rock, the student will, without very much difficulty, gain enough of this branch of knowledge to pass muster in an examination. But when he puts his knowledge to actual test in the field, or even in a museum, he soon becomes aware of the fact that no hard and fast lines can be drawn in petrology, any more than in most other branches of natural science. Almost every type of rock can be found to graduate by imperceptible degrees into other kinds, so that their discrimination, in actual practice, is generally a task of extreme difficulty. It is probably for this reason that hardly any two petrologists are agreed in regard to the principles upon which they found their classification; and it is perhaps hardly too much to say that almost every advanced student of petrology holds to a scheme of classification more or less different from that adopted by his fellow-workers. For this same reason it is difficult to judge how far the merits of a book on petrology are such as to make it really useful to a large number of those who may turn to it for instruction.

Mr. Harker is well known to geologists through his work upon some of the more difficult groups of eruptive rocks of the British Isles. He has had, in addition, the advantage of having been for some time engaged in teaching petrology at the University of Cambridge. A really useful manual of petrology may be expected from him, and these expectations are, we believe, fully realised in the book under notice. Mr. Harker deals, it is true, chiefly with the rocks of eruptive origin, to which nearly two-thirds of the book are devoted; but he has more to say about rocks of sedimentary origin than the majority of other writers on petrology, while the difficult subject of metamorphism he deals with in a much more satisfactory manner than any other writer who has ventured to discuss it at all.

In a book dealing with so many facts about which so much difference of opinion exists, it is hardly fair to find fault with innovations. We may, perhaps, be per-

mitted to express an opinion that few working geologists will be inclined to follow the author in using the term "Intrusive" for "Trappean," as distinguished, on the one hand, from the rocks of deeper-seated origin (Plutonic Rocks), or on the other, from the true Volcanic Rocks. Those geologists, however, who have been plagued from time to time by the loose way in which the term "Porphyrite" has come to be used, will gladly welcome the restriction of the term to the Trappean equivalents of the Plutonic Diorites and Volcanic Andesites.

The book is full of good matter, clearly stated, and can be confidently recommended not only to those who are attending petrology classes, but also to that much larger section of workers in geology who are gathering their facts and ideas regarding rocks directly from study in the field.

Ritters Geographisch-Statistisches Lexikon. Erster Band. A—K. Leipzig: Otto Wigand, 1895. Pp. 1064. Eighth edition. Edited by Johs. Penzler. Pp. 1064.

In this first volume of the new edition of Ritter's Lexikon, one has a most excellent illustration of how a "Gazetteer of the World" ought to be compiled. Comprehensive and yet concise, its pages teem with information; and it is hardly possible to compress facts within narrower limits than those to which the compilers of the Lexikon have restricted themselves. Its minuteness is amazing. The Scottish reader, who naturally turns to Scottish place-names, will find that such little-known places as Arisaig, Birsay, Clunie, Ednam, and Freuchie are duly noted, together with any statistical or other information suited to such a work, while the inhabitants of a certain town in the south of Scotland will rejoice to find that "Duns," and not "Dunse," is recognised as the proper spelling of that name. In such a work, however, some errors are unavoidable, and of these a few may be pointed out, the locality selected being Scotland. East Lothian is described as on the Firth of Tay, and in one place (*s.v.* Dunbar) it is called "Hattington." Roxburgh is spelt "Rockburgh" and "Rouxburgh" (*s.v.* Ednam and Edinburgh); while the island of Barra is mysteriously styled "Barra Barby." Fort William, a town of nearly 2000 inhabitants, is simply described as "a fort," although the fort from which it got its name was dismantled thirty or forty years ago. The Firth of Forth is correctly named in one place; in another it remains untranslated as "Forthbai"; and again it figures as "Forthgolf." The town of Coupar-Angus, which until 1891 was partly in Forfarshire, but which at that date was wholly assigned to Perthshire, appears in two parts of the Lexikon,—first as Coupar-Angus, Forfarshire, with a population of 2375, and then as "Cupar of Angus," in Perthshire, with a population of 2980 (both of these figures being different from the 2106 returned in 1891). This confusion with regard to the county which claims Coupar-Angus is probably shared by a number of people in this country, and it is therefore quite excusable in a foreign gazetteer, although it is proper to point out the error. It may be mentioned that the population of Cupar-Fife is correctly stated, as is also that of Edinburgh; but the "618,471" assigned to Glasgow is a little puzzling. According to the census of 1891, Glasgow proper had 565,714 inhabitants, and the addition of 91,232 living in the suburbs, incorporated on 1st November 1891, brought up the total to 656,946, neither of which totals agrees with that given in the Lexikon. For this discrepancy there may, however, be some good explanation.

These are a few inaccuracies, picked out at random from the pages of the Lexikon. It is not unlikely that the list could be extended. But such slips are only trifling blemishes in what is really an important and valuable work.

A New Geography on the Comparative Method. With Maps and Diagrams. By J. M. D. Meiklejohn, M.A., Professor of the Theory, History, and Practice of Education in the University of St. Andrews, etc. Thirteenth Edition—Seventieth Thousand, Revised and Corrected. London: Alfred M. Holden, 1895. Pp. 1+504. *Price* 4*s.* 6*d.*

It is cheering to know that so sound and admirable a book as Professor Meiklejohn's New Geography has enjoyed and is enjoying, in spite of its high price, so large a share of popularity as is indicated by the numbers on the title-page of this edition. Wherever it is used, it cannot fail to exert a wholesome influence on the teaching of the subject. The revision and correction have on the whole been carefully done. We note, however, that Professor Meiklejohn, in spite of our remonstrance, persists in stating that Niagara is only 120 feet high, and that the Canadian Fall is only 1900 feet wide. As the American Fall is said to be only one-third of the former in width, it can be no more than 630 feet. According to Chambers, the dimensions are: Canadian Fall, 2640 feet wide, 158 feet high; American Fall, 1000 feet wide, 162 to 169 feet high. The accounts of South Africa are not quite "up to date." Vryheid ("the new republic") *has* been incorporated with the Transvaal, in which, also, a part of Swaziland has been included. In connection with gold, "especially at Lydenberg" is antiquated, in view of the greater advance of Johannesburg. Bechuanaland is mentioned as a protected State; but there is no recognition of the Crown Colony. Zululand was declared British territory so long ago as 1887, but that is not mentioned. Among Cape towns, the population of Port Elizabeth is understated, and that of Grahamstown is overstated; while there is no mention of Beaconsfield and Paarl, both of which have gone beyond King William's Town.

London in 1895. Originally Compiled by Herbert Fry. London: W. H. Allen and Co. Pp. 252. *Price* 1*s.*

The information in this annual publication is full and useful to strangers in London. We have noticed it several times in former years, and in the present issue there is little, if anything, new.

Horne's Guide to Whitby. Whitby: Horne and Son, *Gazette* Office, 1895. Pp. 136. *Price: Paper,* 6*d*; *Cloth, with Maps,* 1*s.*

The last edition of this useful little guide was noticed in vol. ix. p. 555. The present (fourth) edition is not essentially different. Three or four views have been added to the list, and the type and paper are decidedly better.

Illustrated Guide to Perthshire and Central Scotland. By Thomas Hunter. Perth: Thomas Hunter, 1895. Pp. 15+262.

This year the *Guide* has been considerably extended, chiefly by a chapter on the West Highland Railway, and another on the Golf Courses of Perthshire. Also the illustrations are more numerous. The improvement has been made of printing the names of places in thick type, so that they quickly catch the eye. It would be well if the number of the page where a full description of a place is to be found were printed in thick type in the index. As it is, several pages have often to be referred to before the right one is found.

Deeside. By Alex. Inkson M'Connochie. Aberdeen: Lewis Smith and Son. 1895. Pp. 157. *Price, Boards,* 1*s.*; *Cloth,* 2*s.*

This is a second edition of the handy and useful volume reviewed in vol. ix. p. 673. A few small alterations have been made here and there, but the book

is not materially altered. The printing and paper are better and several illustrations are added.

Bruckmann's Illustrated Guides. The Highlands of Bavaria, with Salzburg and the Adjacent Parts of the Tyrol. By Dr. Gsell Fels. Pp. xvi + 238. *Price* 2*s.* 6*d.* *Munich.* By Dr. Gsell Fels. Pp. xvi + 64. *Price* 1*s.* Munich: A. Bruckmann; London: Asher and Co., 1895.

Tourists who wish to obtain more than a superficial acquaintance with any particular district require fuller information than can be contained in a general guide, however excellent it may be. This want is well supplied for Munich and the Bavarian Highlands in these publications. All particulars respecting routes, conveyances, hotels, etc., are very full, and there is a plan of Munich, a map of Southern Bavaria and the adjacent districts, and another of the environs of Munich. The large map contains a great number of names, but is rather rough in execution. The guide to Munich is simply an excerpt from the larger book.

An Oriental Holiday. Bosnia and Herzegovina. A Handbook for the Tourist. By Henri Moser. Drawings by Georges Scott. London: 14 Cockspur Street, 1895. Pp. 76.

This small illustrated handbook has been written for the International Sleeping Car and European Express Trains Company, to show what attractions Bosnia and Herzegovina offer to the tourist. Though not of startling grandeur, the scenery depicted in the views is certainly of great beauty, and the tourist who is familiar with the more frequented parts of Europe would probably enjoy a visit to this semi-Oriental country.

The Guide to South Africa for the Use of Tourists, Sportsmen, Invalids, and Settlers. Edited annually by A. Samler Brown and G. Gordon Brown, London: Sampson Low, Marston, and Co.; Cape Town: J. C. Juta and Co., 1895. Pp. xlii + 354. *Price* 2*s.* 6*d.*

This *Guide* is an enlargement of Brown's *South Africa* reviewed in vol. x. p. 53, and is edited for the Castle Mail Packets Company. The additions are distributed nearly all over the book. More detailed information is given on agriculture and mining, railways, sport, etc.; the information about Matabeleland and Mashonaland is very much fuller than in the last edition. There are also more maps. The *Guide* will be most useful to a visitor to the Cape, whatever may be his particular object in going there.

Guides of the Swedish Tourists Club, No. 8. *Swedish Scenery and Places of Interest. Some Hints for Visitors to the "Land of the Midnight Sun."* Second edition. Stockholm: Wahlström and Widstrand, 1894. 14 Illustrations. Pp. 56.

The title sufficiently explains the contents of this small guide, which may well be consulted by those who wish to visit Sweden. Most of the illustrations are good.

Wegweiser des Schwedischen Touristenvereins, No. 10. *Stockholm, die Hauptstadt Schwedens.* Stockholm: Wahlström and Widstrand. Leipsig: K. F. Koehler. With 60 Illustrations. Pp. 147.

This copiously illustrated handbook of Stockholm gives the tourist a fair idea of what he will see if tempted to visit that northern capital. But only a fair idea, for the reality infinitely exceeds the imperfect process-block illustrations, though some of them are good enough in their way.

NEW MAPS.

WORLD.

NEW CYCLOIDAL PROJECTION, devised and employed by the late Lieut.-Colonel Thomas Best Jervis, F.R.S., F.A.S., F.R.G.S., F.G.S., Bombay Engineers.

Of the mode of construction of this Projection we have no complete information, and the specimen sheet, extending, as it does, only over 40 degrees of longitude and 18 of latitude, is insufficient to give a proper test of the merits of the Projection. The inventor was a surveyor of considerable note in India, and any conception of his is entitled to consideration. We hope that a full description will be given at an early date by the Chevalier G. Jervis, son of the inventor.

EUROPE.

SCOTLAND, Bartholomew's Reduced Ordnance Survey of ——. Sheet 4, Moffat District; 6, Jura and Islay; 7, Glasgow and Clyde; 8, Edinburgh to Glasgow; 14, Arisaig and Rum; 20, Central Ross-shire.

——. Flag Maps, No. 2. Patented by H. Morley, Stockport. *Price* 1*s.* 6*d.*
W. & A. K. Johnston, Edinburgh.

This map is an ingenious contrivance for teaching young children in Kindergarten schools or the lower standards of the Board Schools some of the physical features, etc., of a country. Flags of different colours are to be inserted in the holes of the map where the rivers, mountains, etc., are situated.

RUSSLAND, Geologische Karte von ——. Auf Grundlage der vom Russischen Geologischen Comité herausgegebenen Karte in 1 : 2,520,000 redigiert von A. Supan. Massstab 1 : 10,000,000.
Petermanns Mitteilungen, Tafel 9.

AFRICA.

CÔTE D'IVOIRE, Carte de la ——. Dressée par M. H. Pobéguin, Administrateur Colonial. Échelle de 1 : 150,000. Les quatres premières feuilles—Grand Lahou, Tiassalé, Ouosso et Toumodi. Levers executés en 1893-94.

GUINÉE ET DU SOUDAN FRANÇAIS, Cartes des Régions méridionales de la ——. Dressée par M. le Capitaine Levasseur. 2 Feuilles. Échelle de 1 : 500,000. 1894. *Presented by the Ministère des Colonies.*

AMERICA.

UNITED STATES, Geological Survey of the ——. Chas. D. Walcott, Director.

GENERAL MAPS. Scale 1 : 62,500.

Maine: Bath.

Nebraska: Grand Island, Kearny, Minden, Wood River.

New York: Ausable, Cape Vincent, Catskill, Chittenango, Ithaca, Mooers, Mt. Marcy, Oneida, Ontario Beach, Oriskany, Rochester, Pulaski, Rhinebeck, Sacketts Harbor, Stony Island, Syracuse, Watertown.

New York—Pennsylvania: Elmira.

New York—Vermont: Cambridge, Plattsburg, Rouse Point.

North Dakota—South Dakota : Savo.

South Dakota : Columbia.

Washington : Seattle.

Scale 1 : 125,000.

Kansas : Ellis, Hill, Norton, Phillipsburg.

North Carolina—Tennessee : Cranberry.

Tennessee : Loudon.

Special Map.

Rochester, New York, scale 1 : 62,500.

Presented by the Director.

ATLAS.

PHILIP'S HANDY VOLUME ATLAS OF THE WORLD. By E. G. Ravenstein, F.R.G.S. *George Philip & Son, London and Liverpool.*

Though published as an enlarged edition of an Atlas which appeared some years ago, this volume is essentially a new production, the whole of the maps having been redrawn. On the whole it is a useful Atlas, the maps being clearly printed, and full of names. Railways might have been more clearly marked. Some improvements have been made in transliteration of names. For instance, in Russian names the *t* commonly used in such names as "Chelyuskin" is omitted, and *f* is substituted for *v* in "Rostof," etc. There is, however, a want of uniformity; we find "Verkho*y*ansk" and "L*i*akhof," "Kolgu*y*ef" and "Gur*i*ef," "Tashken*t*" and "Novgoro*d*," "Mertv*y*i Kultuk" and "Sar*i* Kam*i*sh." Again, "Zlatoust" is correctly spelled on one map, and appears as "*S*latoust" on another; so also we find both "Obchei" (it should be "Obshchii") "S*i*rt" and "Obchei S*y*rt."

NEW CHARTS.

RED SEA, Meteorological Charts of the ——. Published by the Authority of the Meteorological Council. *Presented by the Marine Superintendent.*

Two series of Charts are contained in this important publication, the one showing the winds, pressure, and air temperature, and the other currents, specific gravity, and sea temperature, for every month in the year. For the preparation of the former nearly 75,000 observations have been collected from log-books of her Majesty's ships, and of the vessels of the Peninsular and Oriental Steam Navigation and others. Both the frequency and the strength of the winds are indicated by a new form of wind-rose. A large range of temperature is noticed by Lieut. Baillie, in his *Introductory Remarks*, as occurring near Perim. It amounts to 26° at the period of the south-west monsoon.

LAKE SUPERIOR. Published June 1895.

LAKE HURON AND GEORGIAN BAY. Published June 1895.

LAKES ERIE AND ONTARIO, with the southern parts of Lake Huron and Georgian Bay. Published July 1895.

The U.S. Hydrographic Office, Washington.

THE SCOTTISH
GEOGRAPHICAL
MAGAZINE.

FORMOSA.[1]

By JOHN DODD.

GENERAL DESCRIPTION.

THE island of Formosa is generally supposed to have been known to the Chinese and Japanese as far back as the thirteenth century at least, and in the sixteenth century, if not before, to have been visited by Portuguese, Spanish, and Dutch traders. In the seventeenth century the Spaniards had a settlement in the north,[2] and the Dutch extensive possessions in the south-west and in the western plains, extending to the hills behind Tai-wan-fu, now called Tai-nan-fu. During the early part of the present century, parts of the island were surveyed by our own naval commanders, and in a chart dated 1845 the height of the highest peak, Mount Morrison, is given as determined by Captain, afterwards Admiral, Collinson. In my own time, in the early sixties, surveys were made by the commanders of the *Serpent* and *Swallow*, and by Captain Brooker of the *Sylvia*, who took the altitude of Mount Sylvia and of the highest peak at the southern end of the Western, or Dodd, range, both over 12,000 feet high. The junk trade between Formosa and China must have been carried on for centuries—long before the Dutch occupation—and those engaged in the trade were well acquainted with the country occupied by the Chinese settlers.

After Hongkong was ceded to Great Britain in 1842, vessels began to visit the island, and in the fifties schooners were despatched more and more regularly by the two largest British firms in China up to Swatow, Amoy, and Fuchow, with orders to call at Formosa; and it is principally

[1] Abstract of a paper read at the meeting of the British Association, 1895.

[2] Most probably the ruins on Palm island, Kelung Bay, are those of Fort San Salvador, built by the Spaniards in 1626.

owing to these firms that the trade of Formosa has been opened to foreign enterprise. The trade was then very lucrative, and it was soon discovered that the island produced rice and sugar, chiefly in the south, and that in the northern parts camphor was obtainable. Sulphur also, indigo, hemp, and other articles were exported in exchange for opium and a small quantity of Manchester goods. In those days the exports largely exceeded the imports, and the difference in value was paid in chopped Carolus dollars, commonly called "pillar" dollars.

In consequence of the increase of British trade with the island, the British Consul Swinhoe was despatched in 1857 to Formosa, and his report probably led to the establishment of consulates in the island. He was an ornithologist, and was the first foreigner, I believe, to procure specimens of a new species of pheasant, found only in the wilds. It received the name of the Swinhoe pheasant. Other British consuls since Mr. Swinhoe have drawn up valuable reports, and an interesting pamphlet was written in 1871 by General Le Gendre, U.S. Consul, while for the southern part of the island and its native population Mr. Pickering, C.M.G., is the best authority. The best official reports on the trade of Formosa are undoubtedly the *Imperial Maritime Customs Returns* and *Reports*, compiled and printed by order of Sir Robert Hart, Bart., Inspector-General of Imperial Customs. They contain the most reliable statistics of trade from 1864 up to the present, and much information concerning the natives, tides, meteorology, etc.

The Chinese name for the island is Tai-wan, but I learn from Mr. R. S. Gundry that, according to some Dutch authority, it was at one time called Liu-chiu. Tai-wan means, I believe, "terraced land," and well describes the configuration of the mountain ranges as they appear to a traveller on the western coast or making a voyage from Tai-wan-fu to Tamsui. These mountains rise, one above the other, from the plains and tablelands in Chinese territory, beginning with low ranges, one to two thousand feet in height, behind which are others attaining to an altitude of 3000 to 5000 feet; and this succession of steps is continued until the backbone of the island is reached, in which the highest peaks stand 9000 to 12,000 feet above sea-level. These lofty mountain ranges, all covered with forest, and for the most part unexplored, run nearly the whole length of the island, and, with a few exceptions in the north, all trend in the same direction as the longer axis of the island.

These remarks apply to the western side. On the eastern coast there are no extensive plains, except the Kapsulan plain in the Komalan district on the north-east, and all along the coast the rivers are insignificant, with short courses, while the bays and inlets are capable of receiving only small craft. Into the harbour of So-oh, however, schooners of 100 to 120 tons can enter and steamers of light draught. South of So-oh the forest-clad mountains rise in most places straight out of the sea, forming a bold coast-line unsurpassed, perhaps, for beauty and grandeur. Even where sandbanks and beaches have been formed at the entrance of small bays, huge serrated rocks project into the water, against which the long swell of the Pacific breaks its force as it dashes on to the sturdy

barrier of slate and metamorphic rocks that compose the mountain masses on this side of the island. The climate is here no doubt affected by the Kuro-shiwo, which sweeps northward, at no great distance from the land, at the rate of two knots or more per hour. On approaching close to the land, you seem to get gradually out of the current.

The extreme length of the island—from the points Foki and Syauki in the north to the South Cape—is not much less than 245 miles. To the north of the parallel of 23° N. lat. its maximum breadth is about seventy miles; to the south the island tapers away to the southern extremity, where a lighthouse was erected some years ago. Formosa is bounded by the parallels of 21° 54½′ and 25° 18½′ N. lat., and the meridians of 120° and 122° E. long. China is separated from Formosa by the Formosa Channel, the nearest points—say, Sharp's Peak at the entrance of the Min river and the nearest point on the west coast of Formosa—being about 100 miles apart.

In the Formosa Channel, to the west of Formosa, lie the low flat-topped Pescadores islands, of which so much has been heard of late. Occupied by the Chinese a few years previously, they were not held of much account by the Chinese Government until the Japanese landed at the south-west of Formosa in 1874 to punish the bloodthirsty savages of the hills for the murder of a shipwrecked Japanese crew on the east coast. Afterwards the Chinese recognised the value of the fine harbours situated in the Pescadores. Makung is capable of sheltering the largest men-of-war of the present day. Such harbours are precisely what Formosa lacks. Now that Formosa and the Pescadores have been ceded to Japan, it may be expected that Makung, with its comparatively safe and commodious anchorage and commanding position on the highway of trade, will become a formidable southern headquarters of the Japanese navy; and, should troubles arise in the Far East between foreign and Eastern nations, the importance of the acquisition of the Pescadores will be more apparent than at the present moment.

I will now briefly allude to some of the other islands in the neighbourhood of Formosa. South of Takao is a small island called Lambay, and due south of the southern promontory lies the Bashi group, between which and the north of Luzon are situated the Babuanes. In 1867 Mr. Pickering ransomed from a tribe called the Tallasocks a number of Bashi islanders who had been driven on to the south-east coast by the wind and current. Probably in earlier times many of these islanders were drifted on to the coast of Formosa and never returned.

Off the south-east coast lie the Botel Tabago islands, a little higher Sama-Sana, and still farther north, opposite Tao-sia, the port of Kapsulan, is Steep, or Turtle, island. Then, outside Kelung, stand Palm island and Bush island, inhabited by Chinese fishermen and a few Pepo-hwans. The wedge-shaped Kelung island, close beside it, serves as a landmark for mariners. To the north of Kelung island are scattered several islets—Agincourt, Craig, and Pinnacle—all of volcanic origin. Stretching east and north-east, almost to the southern extremity of Japan, are the Sa-ki-shima—formerly called Mei-a-ko-sima—and Lu-chu groups, inhabited by people of Japanese origin, who have, however, for a long time past been

tributary to China. I may here mention a curious phenomenon in the Formosa banks in the south of the Formosa Channel. Steamers avoid them, but in the old schooner days captains sailed close to them, and many old skippers have told me that on these banks are springs of fresh water bubbling up through the salt.

Earthquakes occur frequently in certain years, but, as a rule, not much damage is done. The worst earthquake was in 1867, when the bodies of seventeen Chinamen were taken out of their huts at Tamsui, and a temple in course of erection at Hu-wei, the port of Tamsui, fell down. At the same time at Kelung a tidal wave rose five feet higher than the usual height of the tide, which is only three feet. Before the water receded from the bay, a column of water and steam or spray was seen to rise to a considerable height. Singularly enough, at Tamsui, only thirty miles west of Kelung, there was no disturbance in the water. At Palm island I have often gathered pieces of pumice, occasionally looking like coal pumice. Its presence in such large quantities suggests that a submarine crater has existed not far from the entrance to the bay, and possibly the axis of eruption may pass through submarine coal seams. Petroleum exists in several parts of the interior, and the crews of vessels passing the island at night have often wondered what the lights were on the sides of the hills to the east of Owlan, a Chinese port on the west coast. Here, and elsewhere on the island, these fires are due to the ignition, by the sun's rays, of the gases rising from the soil. In broad daylight I have found my canvas shoes burning, and on moving from the spot I could see the flame hovering and flickering over the ground. On my first visit, a native threw a piece of dry grass on the spot, and it broke out into flame. At night extensive patches of the ground are all ablaze, and occasionally large forest fires occur, which at one time made mariners and Chinese, who had never ventured into the hills, believe that there were volcanoes in activity. I discovered the petroleum wells in 1865 on my first visit to the lofty mountains, soon after named the Sylvian range, and the Dodd or Western range. After three hours' journey from Owlan, in a direction east by south, I came to the town of Bah-li, and then proceeded across the flat plain as far as a village called Ai-lioka, the last on the Chinese side of the river. Continuing along the bank of the river, I came to the entrance to a large valley, which I afterwards named Petroleum valley. On one side of the river the land was cleared and occupied by Chinese; on the other were mountains covered with forest trees and jungle. On the latter side I found a spring, from which mingled oil and water was flowing into the river. It is situated 15 to 18 miles from Owlan, near a place called Kuhow. Obstructions on the part of the mandarins, and the reluctance of workmen to cross the river into the territory of the savage tribes, prevented my working the springs properly; and after eight years' delay I was informed that the Chinese Government claimed all rights in the land, even in savage territory. To this day the springs are not worked, though an unsuccessful attempt to work them was made by the Chinese, but the Hakkas now established on that side of the river collect the oil in tubs, and use it in a crude state for various purposes.

Though Formosa has a harbour or two, they are not well adapted for shipping of the present day, for Kelung alone can accommodate large vessels in its outer harbour, and that is much exposed to the north-east monsoon. In the south-west only two ports are open to foreign trade—Tai-nan-fu and Takao. Tai-nan-fu, the old capital of Formosa, is a populous city, and has been the most important town ever since the expulsion of the Dutch. At that time vessels could sail up to the city, and An-ping, where the old Dutch fort Zealandia stood, was an island, since united to the mainland by the retreat of the sea. Now the shipping stops at An-ping, and only small boats can ascend the creek up to Tai-nan-fu. The roadstead is safe enough during the north-east monsoon, but during the south-west monsoon and typhoon season, ships, being on a lee shore, would be in a dangerous position.

Takao, about thirty miles south of Tai-nan-fu, is situated at the foot of Ape's hill, the only elevation all along the coast between Takao and the entrance to the Tamsui river that has any claim to be called a hill. To the south of it lies a lagoon-shaped harbour with a very narrow entrance, where schooners, brigs, and steamers of light draught can anchor. During the north-east monsoon the bulk of the rice and sugar cargoes is exported from An-ping, but when the south-west monsoon is blowing a great deal of produce is exported from Takao, which is accessible at all seasons.

In the north are the port of Tamsui on the west, and the port of Kelung on the east, some thirty-two miles apart by sea. Tamsui is a river port, and has a bar at the entrance with eight to ten feet of water over it at ebb tide, and a rise and fall of seven to ten feet. Within the bar the river runs between the Lohan hills to the south, about 1700 feet high, and the Tatun-soan range on the north, of which the nearest peak, about 2800 feet high, is surmounted by an extinct crater; the highest point, in the north-east of the range, called Chao-soan, rises to more than 3600 feet above the sea-level. In this range, on the northern slopes not far inland from Double Rock, the Kim-pao-li solfataras at an elevation of 1500 feet are still active, and some also exist on the western slope, all giving out sulphur. On the latter side, 500 feet below the crater of the loftiest peak, sulphurous steam is ejected, and a little lower down emerges a stream of scalding water. Close to it is another stream, cold enough to cool bottles of wine or beer in the summer. For a considerable distance round, the hillsides seem covered, as it were, with cancerous or ulcerous sores, which give off jets of sulphurous steam, accompanied by a noise like that of a dozen steamers blowing off steam at the same time. The hot stream runs down the hillside and falls into the Kan-tao creek leading into the Tamsui river.

Ships anchor in the river between the villages of Hu-wei and Phi-a-tao. Up the river about nine miles is the town of Twa-tu-tia, the headquarters of the tea trade in the north. A mile farther up is Banka, the old emporium, which, when the preparation of tea was started, was not found to be a suitable site for the buildings required for the industry. I, therefore, fixed on Twa-tu-tia as much more convenient in every respect, and established myself there; other foreigners followed, and Banka was soon almost deserted by European merchants. Behind these

towns, within five minutes' walk, is situated the new northern capital, Tai-pei, chiefly consisting of the residences of officials.

The fourth port, Kelung, is the only one which can accommodate large vessels. The scenery at the entrance of the Tamsui is beautiful enough, but as you steam into Kelung Bay you enter a country which seems in some undefined way familiar. On the slopes of the Tamsui hills fir plantations are scattered here and there in the foreground, and clumps of banian trees, and the inevitable bamboo groves surround the farmsteads, but all the rest of the landscape is bare, with nothing but cold outlines. At Kelung, however, wherever you turn your eyes, you recognise that Nature must have been at work in an angry moment, and after raising the island considerably above its former level—as can be seen by wave marks—has scattered the hills about in wild confusion. Seen from high ground, these hills look like waves of the sea suddenly congealed. About the harbour they are 200 to 800 feet high, and gradually increase in elevation towards the interior. They are in places clothed with verdure, the climate being rainy, and some of them are covered with thick jungle, the haunt of the common pheasant. All the hills are of coal-bearing sandstone containing fossil plants resembling those now in existence. The whole district from Kelung to Pi-tao point, and all along the rapids near Wan-wan, is full of bituminous coal, and gold has been found in no inconsiderable quantity. Lignite also occurs.

The harbour of Kelung runs north-east and south-west, and at the latter end the town is built, which is always in a filthy state. The undergrowth and tropical plants on the hills are pleasant to the eye, but in the summer months they, as well as the swamps below, are hot-beds of malaria. There are two harbours—the inner, shallow near the town, but gradually deepening outwards, and capable of admitting vessels drawing 16 feet; and the outer, where vessels of 26 feet draught can safely anchor, partly sheltered from the north-east monsoon by Palm island.

So-oh, fifty miles south of Kelung, which has already been mentioned, is a dirty little walled town with 200 or 300 inhabitants. The savages live in the hills close behind, and are at continual feud with the Chinese.

The Inhabitants.

The aborigines who now occupy the highlands of Formosa are of short stature, and not very dark skinned, and are, no doubt, of Malayo-Polynesian origin.[1] A tribe consists of two hundred to a thousand persons. Sometimes it is split up into sections living in scattered villages. The chief resides at the headquarters of the tribe, and those members residing at a distance are ruled by petty chieftains. The languages in the north and central portions of the island are so various, that a tribe occupying one side of a hill often speaks a different dialect from that used by a tribe on the other side. The natives, too, who live high up in the loftier mountains have a different dialect from that spoken at

[1] They have, however, mingled, I believe, with an earlier race, which may have been of Indian extraction.

lower levels. Their clothing is also different, for in some years I have seen the high ranges in the centre of the island covered with snow even in June and July, and therefore thick garments of skin are necessary, while 5000 feet below, the natives are almost naked.

The hill tribes of the northern and central mountains are not a tall race; few measure more than five feet nine inches in height, and the majority are, I should say, under five feet six inches. The men of certain tribes in the south, such as the 'mop-headed' savages living to the south of Mount Morrison, are of larger mould than the people to the north of lat. 24°. Young healthy warriors have a rather fair complexion, shaded over, however, with a faint darkish tint something like that of Japanese skins. The heads of the northern savages being usually small and round, their faces also are not very large and full, though, as in all countries, there is much diversity; indeed, in Formosa the variety among so many distinct tribes is greater than elsewhere, and this, together with the numerous wrecks of vessels of all kinds that I saw during my residence in the island, has led me to the belief that from very early times the population has been frequently increased by the arrival of castaways. Fishermen from the southern isles were probably carried by the Kuro-shiwo current to the shores of Formosa, and, intermarrying with the aborigines, modified the original stock, of which pure specimens are now to be met with only in the recesses of the highest ranges of the interior. Certain tribes in the north and in the Dodd and Sylvian ranges invariably point southward when asked whence they came, and even the Pepo-hwans, half savages of Malayan type, say that they originally lived in the south of the island. The Pepo-hwans, or Shek-fans as the Chinese call them, were, I am convinced, in possession of the western plains at the arrival of the Dutch, and it was they whom the Dutch lived amongst and converted to Christianity.

Continuing my description of the hillmen, I may mention that they have dark eyes straight-cut, with, in youth, a piercing fixed look, which, after years of struggle with the pigtailed invaders, changes into a dogged sinister expression. The eyes are never oblique, nor do the people exhibit any other trace of a Mongolian ancestry. The strong black eyebrows are a marked feature owing to the absence of beard, for, as a rule, all the hairs that appear in the chin or cheek are plucked up by the roots with a small pair of tweezers. The hair—black, straight, and rather coarse—is allowed to flow over the shoulders, but is kept off the face by a circlet round the head, or is tied together at the back of the neck by a piece of string or cloth. In the northern part of the territory of the savages, the forehead and chin are tattooed in horizontal lines, but tattooing of the body is not very general.

As in New Guinea, and among other islands of the Pacific, the custom of boring holes in the ears is also in vogue among the Formosans. Each hole is large enough to hold a piece of young bamboo as large as a Manilla cheroot, adorned with tufts of scarlet long ells. Instead of bamboo, a piece of what appears to be white cuttle-fish bone is sometimes inserted, and circular pieces of the same substance are worn by the men in the centre of the forehead, held in place by a band of hempen cloth or scarlet

camlet tied round the head. Beads, too, are made of it and worn as necklaces, and also serve as a medium of exchange. Men frequently wear necklaces of wild boars' tusks and the teeth of other animals they have killed, as signs of their prowess. Both men and women are passionately fond of manufactured beads, brass bangles, coloured handkerchiefs, and foreign cloths and silks. Old coats and waistcoats are most acceptable presents. The longing of Taba-i-ban, the first Formosan chief I met with, for my waistcoat was the occasion of a disagreement between us, which was nearly ending seriously, though we had drunk "lip to lip"—that is, out of the same bowl with our arms round each other's back and cheeks touching.

The savages are armed with matchlocks (*puh-tus*), which they load with pieces of nails and iron and lead pellets obtained in barter. These are slipped down the narrow barrel right on to the powder, without any wad between. On the right wrist, the man wears a bracelet containing a port-fire, made of the bark of some tree, and protected by a covering of wicker-work or matting of plaited grass. The end of the port-fire protrudes a few inches from the covering, and is always kept alight during the chase. It is ignited by flint and steel, and, burning very slowly, keeps alight for a considerable time. When the gun is to be fired, the port-fire or *chobiet* is placed in a cleft in the hammer, and when the trigger is pulled, it falls into the priming, and off goes the gun under favourable circumstances—in wet weather a flash in the pan is more common than a discharge. Only a small percentage of the natives possess matchlocks; the majority are armed with bows and quivers or deerskin belts of featherless arrows tipped with hard wood or metal, procured from the Chinese. For use in war, the heads are sometimes dipped in a poisonous decoction.

The most useful weapon of the hill savages is undoubtedly the *laluo*, a knife or cutlass about a foot and a half long, of Chinese manufacture. The handle is set in a haft of two pieces of wood which are tightly bound together by withes of split rattan; this haft is often adorned with carving and pieces of metal. The blade is protected by a scabbard consisting of wood on the one side and open wire netting on the other; and part of a Chinaman's tail, or a tuft of hair from the head of a victim killed in some border struggle, often ornaments the sheath. With the *laluo*, the savage cuts his way through the jungle, kills game, splits firewood, and cuts off the head of his enemy. The blades are supplied by the Chinese camphor manufacturers and charcoal-burners in exchange for skins, antlers, venison, animals alive or dead, dried sinews or entrails—the last being much in request by Chinese doctors in Formosa and on the mainland.

The clothing of the savages living in the lower hills adjoining Chinese territory is very scanty, especially in the summer months. A coat called *lukus* is worn; it is like a lounge coat, but without sleeves, and reaches down to the knees. Close to the border, sleeves of coloured skirting or Chinese cloth are sometimes added. The material of which the coat is made is woven of hemp by the native women in a loom of a very primitive description. Four pieces, each nine or ten inches broad, are sewed

together, two behind and two before, so as to leave openings for the arms. Down the front of the coat, which is left open, are sewed rows of beads, etc., as well as round the top and bottom. This garment is bleached, and almost always embroidered from the waist downwards with scarlet or blue long ells. Round the waist the men wear a square piece of hempen cloth embroidered in horizontal stripes, which descends to the knee, and they also wear what they call a fighting coat, like a Zouave jacket, of hemp embroidered all over with scarlet long ells. For wet weather they have coats of skin and small caps of rattan wicker-work, in shape like an inverted finger-glass. The caps are often covered with furs of animals, and the skins of the heads of otters and other animals are sewed outside, and add to the wild appearance of the wearer. A square of hempen cloth thrown over the shoulders and tied together at the upper corners frequently supplies, in hot weather, the place of the *lukus*. In the valleys and plains all clothes are discarded, except the *hab-hock*, a belt of embroidered hemp five inches broad. To this the *lalao* is invariably attached. In the summer, most of the men may be seen wandering about with nothing on but the belt and knife; when tropical showers are frequent, they add to this attire a wicker cap called *mo-bu*, in shape like a jockey's cap, the peak being turned to the back to protect the neck and long lank hair from sun and rain.

Almost every man and boy has a hempen pouch at his neck in which he keeps a supply of tobacco and his flint and steel. Men and women smoke all day, and even small boys and girls are addicted to this pleasant vice; and no wonder that smoking is so universal in a country where the plant grows wild, and fever and ague are prevalent in the forest for many months of the year. The plant must have been introduced by the Spaniards from their southern settlements, or by the Dutch from Java, and through the medium of the Pepo-hwans of the plains, who, no doubt, had at times friendly relations with the hill tribes, was passed on into the interior. The pipes and stems are of bamboo, and the bowls are often tastefully carved and frequently adorned with pieces of brass.

Nearly all my observations of savage life refer to the tribes living to the north of lat. 24° N. South of Mount Morrison and on the south-east coast are numerous tribes, some of which have been visited by Mr. Pickering, who for many years was located at Tai-wan-fu and Takao. He would probably tell you that these southern tribes vary considerably in language, manners, and customs, and that on the south-east coast they are somewhat bloodthirsty, and not free from the suspicion of occasional cannibalism.

The men hunt and fight only, leaving all the hard work to the women. The larger tribes of the north, living in the vicinity of the Sylvian range, and occasionally the Tangao tribes, league themselves with the principal tribes adjoining them on the south, and make common cause against the Chinese invader. On the western borderland, from the hills behind Banka right down to the south of Mount Morrison, the Chinese land-grabbers are constantly at work. Ever since the expulsion of the Dutch, immigrants from Fo-kien, and especially the Hakkas of Southern China, have been pushing their way eastward, gradually ousting the Pepo-

hwans and other descendants of the aborigines of the western plains from their lands. The border between the native and Chinese territory is pretty clearly defined, though ever changing; wherever the hardy Chinese pioneer is found felling trees and clearing the land, is Chinese territory; but wherever the valleys are covered with long grass, and the mountain slopes retain their primeval forest, intertwined with parasitical plants and huge creepers stretching from tree to tree, the aerial pathway of the monkeys, there is the home of the savage. The savages are ever on the watch for Chinese heads, and members of adjoining tribes often hunt in the territory of a chief who has made a treaty with the neighbouring borderers, and who can thus disclaim all responsibility when a Chinaman is missing.

The savages of the female sex are in many ways far more interesting than the men, and the young girls and young married women possess many inherent good qualities not to be found in their husbands and brothers. Notwithstanding their wild surroundings and complete lack of anything in the form of education, they are well conducted, hard and willing workers, and good wives—more like slaves, indeed, than wives. When moving from place to place they carry all their household goods in a net suspended from the forehead—a child, perhaps, included. I have seen women with loads of 50 to 80 lbs. on their backs, following a party of men who considered it beneath them to carry anything but their guns or bows and arrows. The trying drudgery and the discomfort of their homes, including very often lack of nourishing food and proper nursing when ill, make women who were pretty girls in their 'teens prematurely old, haggard, and forbidding in aspect before they are thirty. With all the hardness of their fate they are of a kindly disposition, and are ready to help one another or a stranger. They are modest to such an extent that one is inclined to believe that they are ignorant of the meaning of the word; I could never detect any false prudery among them. Generally speaking, the women are of medium height, but after a few years of hard toil they become squat and sturdy. They are wonderful pedestrians, and are used as messengers, as scouts and spies in time of trouble, and sometimes as go-betweens and peacemakers. The chief of a tribe always insisted on my being accompanied by two or three women as porters when on hunting excursions, or moving from one tribe to another. I have always found women the best passports. When traversing dense jungle and forest the traveller is often interrogated by unseen savages. If alone and unable to give satisfactory answers, a featherless arrow will probably put an end to his explorations; and, but for the female passports, my skull would long ago have been hung up in the ancestral shanty of some dashing young warrior.

The women have black hair parted down the middle, and tied up in a knot at the back of the head. They have dark eyes, and some are rather pretty when young, but ugly faces are more common. Circlets of cloth and scarlet camlet decorate their heads, and a square piece of embroidered hempen cloth is worn as a mantilla, or, in cold weather, is tied round the shoulders. Many of the women wear a diamond-shaped piece of profusely embroidered cloth over the breasts. Another piece is tied

round the waist and reaches to the knees, and, when travelling through the jungle, the women make themselves rude gaiters to protect their shins from injury. It must not be supposed that the women are thus elaborately clothed in all seasons; in summer they dress lightly, like the men, in a sort of kilt tied carelessly round the waist. On the borders the women sometimes wear a *lukus* on great occasions, and, where barter is carried on, deck themselves with bracelets, bangles, and necklaces.

A curious custom is that of extracting the eye-teeth of young girls, which gives them a lisp, and certainly does not add to the attractiveness of their appearance. On the east coast the men also are thus disfigured, but the custom is not in vogue among the inland tribes. Girls are tattooed on the cheeks before marriage. Parallel lines are drawn across the cheek from the upper end of the ear to the middle of the upper lip, and from the lobe of the ear to the chin, and these are connected by a network of diagonal lines, the whole producing the effect of a dark blue veil stretched from ear to ear over the mouth. The same design is seen in the carvings of the pipes, and in the embroidery of the clothes. The arts of weaving, embroidery, and carving may have been introduced by the Malays and imparted by their half-caste descendants, the Pepo-hwans, to the hill tribes. The loom is made out of a piece of hollow tree trunk, about three feet long and a foot and a half in diameter. The weaver sits on the ground with her feet against the log, and the strands of bleached hemp are passed round the wood, and kept tight by a strap round her back. The shuttles are passed backwards and forwards by hand, and the threads of the woof are pressed closely into position by a piece of wood in shape like a long paper-knife. Certain villages are noted for the cloth they produce, especially Dib-bongan, right in the wilds, within thirty miles of Tamsui. The coarser kinds are like rough towelling, and have been made by foreigners into shooting-jackets.

String is made of hemp fibre, and of the string nets are made, which the women carry suspended by a deerskin strap from the forehead. In these are stowed all kinds of articles required by the family when on the tramp, especially on hunting excursions. Mats also of a superior kind are manufactured from the long grass growing in some of the rich valleys through which the Hakkas are gradually advancing. There are four or five qualities of mats; the best, being very fine and closely woven, are capital as mattress coverings, and are much used by the Chinese as sleeping mats in the hot weather. Twenty years ago savage mats, as they were called, were scarce, but when a demand for them arose among foreigners, larger quantities were manufactured, and now many of the coarser kinds are made by Chinese living in the hills to the east of Owlan, where the peculiar grass is obtainable.

The villages of the savages are usually built on an eminence, not far from a brook or river, and a clearing is often made around them. The chief's house is the largest, and is a square building constructed of four or more upright posts supporting a roof of rattan. The sides also are interwoven with rattan and bamboo, and the whole is thatched with long grass. There are two doors, and a hearth of stones in the centre. Around the room settees of rattan, about a foot and a half

high, are fixed to the walls, on which the occupants repose; at meals they sit on the floor. The walls are decorated with bags of skulls, matchlocks and other weapons. There is no outlet for the smoke except through the door. Houses of an inferior kind are combined in one long building fifty feet long by ten broad, divided into ten compartments. In each little room is a rattan sofa which leaves little space to move about in, and the cooking and other utensils are stowed away under the bed and in corners, or hung on the wall.

These border shanties are not the style of dwelling of all parts of the country. Higher up in the mountains a room is digged below the surface of the ground and covered with a slanting roof of branches and long grass, which sheds off the water into a drain sunk around it. Many of the savages are nomadic and find temporary shelter under overhanging rocks or wide-spreading umbrageous trees. Most of the hill tribes have granaries, like a square box, raised on four posts and thatched. Some villages on the border lands are partly built of stone or sun-dried bricks, and are surrounded by bamboo stockades; here are found buffaloes, dogs, goats, fowls, and ducks, and the land is cultivated to some extent. But in these cases the head of the family is usually a Hakka who has married a native woman and availed himself of her influence with her tribe to push his own interests, until at length he has acquired possession of thousands of acres of valuable forest.

Respecting marriages and burials I have not much to relate, for I never, during my excursions into savage territory between 1865 and 1872,[1] witnessed ceremonies of this kind. Among some tribes the corpses are interred in a sitting posture, while in others they are buried in an upright position. Sometimes the bodies are left where they are killed, and, again, I have heard of them being exposed for a time on wooden props. There is no special marriage ceremony that I am aware of. Among the northern tribes a man sometimes runs away with a girl, and they are afterwards considered to be man and wife. I have also understood that a man makes presents to the girl of his choice, and, if she accepts them, the marriage is considered to have taken place. I had for many years business transactions with a tribe to the east of the petroleum wells, making quarterly payments in kind for the right to the oil from all the cisterns of the neighbourhood, and the chief, judging from the weapons I possessed, that I belonged to a tribe much superior to his, wished me to marry into his tribe. As my presents had been accepted by several of his granddaughters, I was told I could have my choice, but a necessary condition was that I should have the hairs of my beard extracted. I got out of the difficulty by pretending that I must refer the marriage question to the chief of my tribe.

The difficulty of explaining who I was and whence I came was very great, for the idea of the savages is that the world is not much larger than the island they live in, and that its inhabitants are divided into the tailed (the Chinese) and the tailless. As I was tailless, dark-haired,

[1] I made occasional excursions during the subsequent years of my residence in the island, going over old ground and verifying positions, but did not explore so energetically as in earlier days.

and about their own size, there was no doubt that I belonged to a tribe of their own race living at some distance.

I could learn very little from the savages about their religion. I never saw any idols in their dwellings. They have a belief in a god or devil (Awetoh); lightning they call *Awe-poonniek* (*poonniek* = fire), and thunder *Bi-su*. Their day is reckoned from sunset to sunset, and distances are measured by the time it takes to traverse them—long distances by the number of sunsets. They are great observers of the heavenly bodies, and in starlight nights are lost in admiration of the beauty of the sky, but have no notion of astronomy. Their doctors understand the treatment of snake-bites and how to heal wounds, applying poultices of certain herbs, and administer extracts of herbs internally, but their medical knowledge is slight. Medicine-men, such as are found among the Red Indians, are unknown in Formosa. Some of the women seem to be afflicted with some sort of mania, and at times fall into a trance; at its conclusion, they sing and dance, the men joining in the chorus. The Formosans have a kind of Jew's harp made of bamboo, and play on whistles, sometimes blowing two at once in their mouths or nostrils. They are fond of dancing and singing unmelodious melancholy songs. They believe in omens and luck connected with certain birds.

The aboriginal hillmen of North Formosa are either killed or forced to retreat by the Hakka borderers; they never amalgamate with the Chinese. The *men* never marry Chinese women, though it is very common for Chinese squatters to marry savage squaws. It is said that, in the south, intermarriages have taken place, and that certain tribes wear pigtails, but I have no personal knowledge of them. The savages live principally by hunting, and care little for cultivating the ground, and have few opportunities of improving their condition by any other means. Although I have a great admiration for them, having always been safe under their protection and received kind treatment at their hands, I must admit that they seem incapable of civilisation. The Pepo-hwans, on the other hand, or Savages of the Plains as they are termed in the local language, are not only tractable and semi-civilised, but were skilled agriculturists before the Dutch occupation. Whether from force of circumstances or other causes, they have freely intermarried with the Chinese, as is unmistakably indicated by the large straight eyes and Pepo-hwan expression often seen on the faces of Chinese men and women in the towns.

The male Pepo-hwans of the coast are nearly all fishermen, but those inland lead the same life and follow the same pursuits as the Chinese, from whom they are scarcely distinguishable. The women of purer breed are fine and strong-looking, upright, and with a firm and elastic gait. They are modest, respectful, and pleasant in manner, with none of the timidity, false bashfulness, and prudery so much affected by Celestial females, expecially the small-footed women in the large towns of Formosa. Though dressed in the same clothes as the Chinese women, these native girls have a very different appearance. Something in the shape of the head and the expression of the eyes betrays their savage origin, and they look at a stranger with an honest and fearless gaze, neither with impudent curiosity nor stealthily, as Chinese women do.

The Pepo-hwans of Palm Island and So-oh Bay speak a language containing many Malay and Javanese words, and they are, no doubt, descended from Malays and the aborigines who dwelt on the plains previous to the arrival of the Malays.

I am of opinion that the hill tribes were the first men to arrive in the island, and that they were followed by the tribes of the plains, who are now extinct or have been driven farther into the interior. Then came the Malay element, at some very early period, probably at the time of the Malay expansion, before, perhaps (as Pritchard remarks), the introduction of cloves and other eastern products into Europe. The last immigrants were Hakkas from Southern China, and traders and settlers from the province of Fo-kien.

The Hakkas, the pioneers in Formosa of the present day, first made their appearance under the Yuen dynasty towards the end of the thirteenth century, when their tribe was defeated in a great naval battle at the entrance of the Canton river and the survivors took refuge in Formosa. Ever since, their numbers have been continually increasing, and are occasionally added to even at the present day by fresh arrivals from the Hakka districts.

The principal occupants of the western and northern parts of the island, however, are the Fo-kien colonists. They speak the Amoy dialect, whereas the Hakka language differs from this as well as from the Canton dialect. Troubles must have been frequent in early times between the Pepo-hwans and the Hakka and Fo-kien settlers, and the arrival of the Dutch in the early part of the seventeenth century no doubt increased the complications. In 1624 the Dutch erected a fortification at An-ping, and as they traded in the island for many years afterwards, they must have been powerful enough to withstand the attacks of Chinese traders from Amoy and keep in order the people of the plains. The latter were even at that time, according to contemporary Dutch reports, of a peaceful disposition, and engaged in agriculture. Besides Fort Zealandia at An-ping, the Dutch are said to have built the strong square brick fort on the north side of the Tamsui river. The walls are enormously thick, and built of bricks that must have come from Java or even Holland. After thirty-seven years, in 1661, Fort Zealandia was taken by the Chinese piratical chieftain, Koxinga, and most of the garrison massacred, the rest flying from the country. After the expulsion of the Dutch the misfortunes of the Pepo-hwans commenced, and from that date the process of ejecting them from their lands has been steadily carried on by the Chinese immigrants.

It was during the Dutch period that Christianity was introduced into Formosa by missionaries of the Reformed Church of Holland. The movement was on an extensive scale, and was energetically and successfully carried out by learned and sincere men among the savages of the plain and also among the hill men. But Christianity was overthrown on the arrival of Koxinga, by whose orders not only the hard-working missionaries were slaughtered, but also great numbers of converted natives. At the present time the indefatigable Rev. W. Campbell of the English Presbyterian Mission is at work among the natives in Tai-wan-fu

and the neighbourhood, while the Rev. J. L. Mackay of the Canadian Mission has taken great interest of late years in the poor Pepo-hwans and their distressed families in the north of the island.

Commerce and Industry.

For some twenty years after Koxinga's victory the Chinese colonists governed themselves, but towards the end of the seventeenth century the island was placed under the control of officials appointed by the Governor-General of Fo-kien, and continued to be administered by them up to very recent times. During the eighteenth century Chinese immigrants continued to pour into the country, and soon Hakka and Fo-kienese villages sprang up all along the coast. On their arrival they were sent inland by the local authorities in search of suitable localities outside the territory already cleared by other pioneers. Large towns sprang up in course of time, like Tai-wan-fu with its 200,000 inhabitants, Ka-gi or Ka-i to the west of Mount Morrison, and Chang-hua a little north of lat. 24°, and, in the north, Teckcham, the local name for Hsin-chu, the populous town of Banka with 40,000 inhabitants, and Twa-tu-tia with 20,000 to 30,000. A new city has arisen behind these two, called Tai-pei, and in the Komalan district is the populous Kapsulan. Between the Chinese towns on the western and northern coasts are numerous smaller ones and many large villages. Considering the area occupied by the Chinese, I should say that the population is excessive, though perhaps not denser than in many parts of China.

When Consul Swinhoe visited Formosa in 1857 he called it the "granary of China," for in those days more rice was grown than was needed for home consumption, and large quantities were shipped off to the mainland. But when the tea trade was started in 1865-66, tea-merchants, planters, and manufacturers flocked into the island year after year from the Amoy districts, so that during the last thirty years the population has enormously increased, and now rice has to be imported when the crops are poor. The Chinese towns and most of the villages are peopled by Fo-kienese, who, in the early days of trade with British merchants, were sometimes stirred up by the authorities against the foreigners, but, as a rule, I have found Fo-kienese merchants friendly disposed, and the coolie class also are polite and good-natured, except when incited by the mandarins, Yamen runners, or soldiers, and show much more patience with foreigners than the latter would show to them, were their positions reversed.

The townspeople are kept in good order by fear of the officials, but the Hakkas on the borders care very little for mandarin rule. The Hakkas are not the only people on the border. At the very limits of civilisation, where charcoal-burners, timber-cutters, and camphor-distillers are at work, many Chinese find an asylum who have escaped from the clutches of mandarindom. Outlaws of this description are totally different from the ordinary Hakka, whose aim in life is to grab a considerable piece of land, cultivate it, marry, and settle down. The men who go in for charcoal-burning and camphor-making, are, as a rule, a

miserable class, often descending below the level of the worst beggar savage of the borders.

I may as well describe here how the Hakkas and others manufacture camphor. Small shanties are scattered over the hills where the camphor-trees grow, and in all directions the clearing of the woods is going on at a rapid rate. Some trees are cut up for camphor-making, others are sawn into planks and knees for the building of junks and boats of all descriptions. Fine specimens of camphor wood, ten feet and more in width and several inches thick, are sent down to the coast, though to facilitate transport they are often cut down considerably before they arrive at the port of shipment. Other timber is also exported, such as the *siao lam*, a beautiful wood nearly as light as maple, and suitable for furniture. There are also hard woods and black wood as heavy as metal: at least seventy species of timber have been collected. On the hillsides are built distilleries consisting of oblong-shaped structures principally of mud bricks, and about ten or twelve feet long, six feet broad and four high. On each side are five to ten fire-holes about a foot apart and the same distance above the ground. On each fire-hole is placed an earthen pot full of water, and above it a cylindrical tube, about a foot in diameter and two feet high, passes up through the structure and appears above it. The tube is capped by a large inverted jar, with a packing of damp hemp between the jar and cylinder to prevent the escape of steam. The cylinder is filled with chips of wood about the size of the little finger, which rest on a perforated lid covering the jar of water, so that when the steam rises it passes up to the inverted jar, or condenser, absorbing certain resinous matter from the wood on its way. Whilst distillation is going on, an essential oil is produced, and is found mixed with the water on the inside of the jar. When the jar is removed the beady drops solidify, crystallisation commences, and camphor in a crude form, looking like newly-formed snow, is detached by the hand, placed in baskets lined with plantain leaves, and hurried off to the nearest border town for sale.

Though sailing vessels traded between Hongkong and Formosa before the establishment of Customs, it was not till about 1860 that the first resident agent of a British firm took up his quarters at Tamsui. The climate, mode of life, and absence of comforts soon wearied out these gentlemen. My predecessor held out for about eight months, and when I arrived in 1864, no one could have been more pleased than he to get across the Tamsui bar.

In those early days the principal articles of import in foreign bottoms were opium, treasure, Manchester and Bradford goods, and minor articles, such as hempen bags, raw cotton, bricks, lead, iron, and tin, manufactured Chinese tobacco, etc. Tai-wan-fu and Takao exported white and brown sugar, rice, sesamum seeds, beans, peas, ground-nuts, hemp, and occasionally camphor turmeric, and fruits. At Tamsui, in the north, camphor was the principal article of export before the tea trade was started; sulphur also, from the solfataras described above, was shipped to Hongkong, but the export has ceased for many years.

Tea is now by far the most important article of export, though camphor is still in demand. Other articles, such as coal, pith paper, skins, rattans,

hemp, sugar, and indigo find their way to the mainland, and a good deal of timber—camphor and hardwood—is also exported.

Coal is the principal export of Kelung. The trade has had many ups and downs, caused by the obstructions placed by the authorities in the way of foreign trade. The coal seams in the neighbourhood of Kelung and in the northern hills as far as the centre of the island are practically inexhaustible. There are also less important imports, such as kerosene oil, wood for tea chests, and pigs of lead to line them, and, when the Japanese have put things in order and the country has been more thoroughly explored, no doubt many other articles adapted for export will be found. With regard to camphor, as in other commercial matters, the Chinese Government has acted very foolishly. For over thirty years to my knowledge there has been a constant demand for camphor, and yet the administration has done nothing to prevent the reckless waste of the forests and taken no steps to provide for the re-afforestation of uninhabited tracts useless for cultivation. True, as far as I have explored the mountains of the interior, camphor-trees seem to be exceedingly numerous, and there is at present no fear that the supply will run short for many years to come. But the increased demand for camphor in these days of smokeless powder may hasten the destruction of the trees, and therefore it is to be hoped that the Japanese will assure the supply in the future by planting saplings on waste lands. I planted a lot in my garden in 1869, and when I left in 1890 they were trees thirty to forty feet high and upwards. From this experiment I conclude that trees fifty years old would be large enough for all ordinary purposes to which the timber is applied. As for camphor, it may be extracted from leaves and twigs, so that comparatively young forests will yield material for the industry.

While exploring the camphor districts in 1865, I came across cinnamon and wild tea plants, the latter being ten or twelve feet high. I got down a fair amount of cinnamon to the coast, but found that the expense of sorting the outer and inner barks and packing them for shipment to England was too great. With tea I was more successful. On making inquiries I found that between Kelung and Banka, and to the south-west of the latter town, small patches of tea were cultivated in the gardens of farmers, but that it was grown principally for home consumption. All the tea I could get I bought up, and finding that it fetched a good price in Macao, I at once made loans to the farmers, through my *compradore*, for the purpose of extending the cultivation, and also imported slips of the tea plant from Amoy. I then started firing on a small scale at Banka, and afterwards took larger premises at Twa-tu-tia. In the course of three or four years, Formosan teas acquired a reputation in America, and before the end of the sixties I had despatched in one year two sailing vessels to America, one with a full cargo and the other nearly full. Others followed my example, and the exports increased by bounds year after year. The Amoy and Fuchow merchants were not at first in favour of Tamsui becoming a tea-port, but before long they began to join in the Formosan tea-trade, and now nearly all the tea is sent to Amoy for sale, and the merchants there have done much to enlarge the yield by heavy

advances to the planters. I have no statistics showing what is the present quantity of tea exported from Tamsui, but I should say that it is certainly not less than 500,000 chests, equal to about 20,000,000 pounds. The hills and soil of North Formosa are excellently adapted for tea-growing, and, indeed, for almost any crop.

The extensive sulphur mines, if worked by the Japanese, might support an important and valuable trade, and coal mines extend all over the northern part of the island and right down its backbone almost the whole length, overlaid by coal-bearing sandstone and in association with blue clay. In this clay, at the edge of the Kelung rapids, I have found beds of marine shells, some bright and strong and others very brittle; among them were specimens of the *Tridacna gigas*. On the east coast lies slate which must have been raised by volcanic force. On the whole, the indications apparently point to the conclusion that the various formations of the island are, geologically speaking, of comparatively recent date.

Formosa is also a gold-producing country, the metal being largely exported from Kelung. Men of an inland tribe informed me that high up on the hills, not twenty miles south of Banka, gold is found in the river bed. The savages have a name for gold and also for quicksilver, the literal translation of which is "silver water." If the interior were explored it would certainly be found to be rich in metals. Iron in large quantities no doubt exists, and silver, I believe, has been seen. In the north, in Chinese territory, I have found plumbago. The rock oil is equal to any in the world. Doctor Letheby, who analysed some samples I sent home in 1866, gave a most favourable report.

Many other subjects on which I touched in my paper read at Ipswich, such as wild animals, hunting, excursions among the savages of the hills, dialects, climate, etc., must be passed over here. Much more might also be said on the trade of Formosa, did space permit.

In conclusion, I must say that British merchants were the first foreigners to settle at the ports, and have undoubtedly done more than the Chinese to open up the coal trade at Kelung, and were the first to start the tea trade, which has grown to such an enormous extent, and that therefore the credit of having laid the foundations of the prosperity of Formosa is principally due to them. It is to be hoped that under the rule of the Japanese the restrictions against trade and mining enforced by the short-sighted Chinese authorities will be removed, that good roads will be made, and that the whole country will improve. British merchants—though at present they fear that their interests may suffer by the influx of Japanese merchants—will, with the start and experience they have acquired, be able to hold their own against all comers.[1]

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[1] Formosan landscapes and sketches of natives, drawn by Mr. Dodd, will be exhibited in the Society's Library during November.

THE PORT OF THE UPPER NILE IN RELATION TO THE HIGHWAYS OF FOREIGN TRADE.

By James Turnbull Playfair Heatley.

When President of the Geographical Section of the British Association at Bath in 1888, Sir Charles Wilson made it the aim of his address to draw attention to the supreme importance for Great Britain of the science of Commercial Geography. "That science," he said, "is not confined to a knowledge of the localities in which those products of the earth which have a commercial value are to be found, and of the markets in which they can be sold with the greatest profit. Its higher aims are to divine, by a combination of historical retrospect and scientific foresight, the channels through which commerce will flow in the future, and the points at which new centres of trade must arise in obedience to known laws."[1] It seemed to Sir Charles Wilson in 1888 that the attempts of Great Britain to open up commercial relations with the interior of Africa had too often been marked by want of geographical knowledge, if not open contempt of it, and by a great deficiency of foresight, but he believed it possible, with our present knowledge of Africa, and by a careful study of its geographical features, to foresee the lines along which trade routes would develop themselves and the points at which centres of trade would arise.[2]

To introduce this paper and indicate its aim, I have cited the views of Sir Charles Wilson on the higher aims of the Science of Commercial Geography. I have now to recognise a debt which I owe to Mr. Mackinder, the President of the Geographical Section for 1895. In a paper which he read to the Royal Scottish Geographical Society in December 1889 on the Physical Basis of Political Geography, he introduced the term "nodal point," which he deemed a very convenient one. "A nodal point," he said, "occurs wherever there is a congestion of traffic on a road, at a ferry or a bridge, at the mouth of a gorge, where two roads cross or join, at a changing place of vehicles, whether from pack-horse to ship, railway-truck to steamer, or river barge to sea-going vessel."[3] In my study of the highways of foreign trade, I have found it very convenient in describing and estimating the relative merits of different routes. But I have thought it might be well to make use of the term "nodality," since nodal point is a term which belongs to Physics. A nodality, then, is a commercial centre on a through line of trade, in accordance with Mr. Mackinder's suggestion.

The scope of this paper is the basin of the Upper Nile, and the aim of it is to show which port affords the best highway of trade from the point of view of the United Kingdom.

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[1] *Report of British Association*, Bath, 1888, p. 737. "The great problem of the future," he said, "is the inland carrying trade, and one of the immediate questions of the day is—Who is to supply the interiors of the great Continents of Asia and Africa and the large areas not open to direct sea traffic?"—*Ib.* p. 736.

[2] *Ib.* pp. 736, 738.

[3] *S. G. M.*, vol. vi. p. 80.

Up to 1882-83 the choice of a port lay mainly between Alexandria and Sawākin. In a paper read in the Geographical Section of the British Association at Manchester in 1887, Colonel C. M. Watson [1] discussed the relative merits of these ports with their respective trade routes. Taking the case of Manchester, he showed that a bale of cotton goods when it arrived at Alexandria was taken by railway to Asyūt, a distance of 360 miles. There it was put into a sailing boat, and sent up the Nile to Aswān, a distance of 314 miles. At Aswān, in order to avoid the first cataract, it was carried four miles by railway to Shellāl, whence it was taken by boat to Korosko, a distance of 112 miles. From Korosko it was carried by camel through the Bishāri Desert to Abu Hamed, a distance of 240 miles. From Abu Hamed it could be conveyed by boat or by camel to Berber, a distance of 170 miles. Thus, the distance from Alexandria to Berber by way of Korosko is 1200 miles, with the trouble and inconvenience of four changes of conveyance on the way.

In the case of Sawākin, the goods shipped to that port could be conveyed to Berber by camel, a distance of some 270 miles (260 to 280 miles) without any change of conveyance.

According to Mr. A. B. Wylde,[2] goods arrive at Sawākin as soon as they can arrive at Asyūt by way of Alexandria. The battle of the routes, he says, commenced first about 1875-76 and proved but a short and decisive struggle. In fact it is a longer and more difficult route from Korosko to Berber than from Sawākin to Berber. Between Korosko and Abu Hamed there is a terrible desert the whole way, with only one well at Murāt.

From the point of view of Great Britain, there cannot be a moment's doubt between Alexandria and Sawākin as ports of the Upper Nile. The commercial cogency of time and cost is decisive.

From the point of view of Egypt, however, the political motive is strong to make use of the Nile valley. Hence several schemes have been mooted to make the Nile a navigable highway. It seemed to Gordon that vessels of considerable draught might make the ascent at the time of high Nile to the Fola Rapids, some 3000 miles from Cairo. But at other seasons most of the cataracts cannot be passed, and even at high Nile it is only for a few weeks (from a fortnight to a month), that navigation is possible. "I cannot look on it as probable," said Sir Colin Scott Moncrieff [3] in his lecture on the Nile at the Royal Institution on the 25th January last, "that it will ever pay to make navigable canals and locks round these cataracts, as it would entail so much hard rock-cutting."

Besides the Korosko route and the Nile route there is also the Bayūda Desert route, which was made use of in the Sudan campaign. This is the route which the Sudan Railway was designed to take. As the Nile is navigable at all seasons from Aswān to Wadi Halfa, a line of railway was commenced in 1873 at Angash, some four miles north of

[1] "Trade Prospects with the Sūdān."—*Journal of Manchester Geographical Society* vol. iii. p. 176.

[2] "The Red Sea Trade."—*Ib.* p. 187.

[3] *The Times*, 26 January 1895: *Nature*, vol. li. p. 445.

Wadi Halfa. It was designed to follow the Nile through the Batn-el-Hajar, the provinces of Sukkōt, Mahās, and Dongola, and to cross the Bayūda Desert from Ambukol or Korti to Metemma opposite Shendi.

It was a very natural desire of the Khedive and Pashas of Egypt to draw the trade of the Sudan down the Nile into the marts of Cairo and through Egypt to foreign parts, but it was a policy which physical facts doomed to disappointment and failure. Up to 1883 the Government insisted on their ivory, which was a monopoly, coming down the Nile; but in the Report of the Cairo Commission, June 1883, which fully considered the question of routes with a view to the making of a railway, it was finally recognised that the Sawākin-Berber route was the best strategically as well as commercially.

But Sawākin is not quite satisfactory as a port, and in a Parliamentary Paper,[1] dated Cairo, 3rd April 1887, Sir Evelyn Baring (now Lord Cromer) said that the difficulties in the way of constructing a railway were much greater than was often believed. Colonel Watson,[2] who was a member of the Cairo Railway Commission in 1883, and has been Governor of the Sawākin district, discussed the Sawākin-Berber route before the Manchester Geographical Society in the spring of 1894. If a railway is to be made from the Red Sea to the Nile, he thinks it would be better to make the port, not at Sawākin but at Mersa Sheikh Barud, which is a natural harbour some 30 miles to the north of Sawākin. The harbour of Sawākin, good as it is and accessible to big vessels, has this disadvantage, that, on account of the great coral reefs which stretch north and south of it, navigation is dangerous except during daylight. At Mersa Sheikh Barud, where the haven is quite as good if not better than that of Sawākin, there is a break in the coral reefs which makes navigation possible by night as well as day. He further suggests that the line of railway should leave the Sawākin-Berber route at Rawai, in order to avoid the deep sand and moving sand dunes in the vicinity of Obāk, some 60 miles from Berber, and terminate on the Nile at Damer.

As the Upper Nile is accessible from Masowa, Italy announced in the spring of this year a railway scheme to connect Masowa with Kasala. The report on the preliminary survey is said to be satisfactory. The line[3] is designed to run from Saāti to Ginda by the valley of the Yangus and Baresa; from Ginda to Keren through Kasen, Az-Teklesan and Ali Beret; from Keren to Kasala, through Agordat and Sabderat. Between Masowa and Kasen it rises to an altitude of 8200 feet. The length of the line will be about 300 miles. There is some talk in Italy of making a line from Kasala to Khartum or to Abu Haraz, either from Kasala direct or by way of Gadārif.

The port, the advantage of which it is the aim of this paper to show, is Akik.[4] The line of route is from Akīk to Khartum by way of Gōz

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[1] *Egypt*, No. 8, 1888, pp. 11-12.

[2] *Journal of the Manchester Geographical Society*, vol. x. p. 107.

[3] *Bolletino della Societa Geographica Italiana*, vol. viii. pp. 123-4; *S.G.M.*, June 1895, p. 315.

[4] The *k* (or *q*) in Akīk (or 'Aqīq) is pronounced in the Sudan like a hard *g*. Hence Akīk may be written Agig.

Rejeb. As early as 1865, when the littoral territory was ceded to Egypt, and there was some talk of a railway, Heuglin [1] pointed out that the best haven for a port was at Akīk. His line of route was by way of Kasala to Abu Haraz, whence the Bahr-el-Azrak is navigable to Khartum. Colonel Stewart,[2] in his Report on the Sudan in the spring of 1883, recognised the possibility of Akīk as the port of the Upper Nile. His line of route was by way of Goz Rejeb, in order to bring Khartum into direct communication with the maritime highways of trade.

From Akīk to Goz Rejeb the distance is some 270 miles, and from Goz Rejeb to Khartum it is some 180 miles. The line of route is from Akīk by way of the Tōkār district, up the Baraka valley and the Langhēb valley to the district of Filik in the valley of the Gāsh. From Akīk to Afafit in the Tōkār district the distance is 40 miles. From Afafit to the vicinity of Wandi in the valley of the Langhēb, where the route meets the main caravan route between Sawākin and Kasala, it is some 80 miles, whence it is some 70 miles by way of the Ermenab valley to Rāsai. From Rāsai it is some 40 miles to the vicinity of Filik, whence it is some 30 or 40 miles to Goz Rejeb. The highest point on the line is about 1650 feet, more than half way to Goz Rejeb, with easy grading and no difficulties; whereas the line from Sawākin to Berber rises to a height of about 2800 feet at Wadi Haratri within 70 to 80 miles of Sawākin, and the line from Masowa rises to a height of 8200 feet between Masowa and Keren.

In stating the case for this highway of trade from Akīk to Goz Rejeb and Khartum, I have now to say that the port of Akīk is the best haven on the Red Sea. The name of the bay is Khor Nowārat; sometimes it is named Bahdūr Bay or Akīk Bay. It is, without exception, according to the *Red Sea Pilot*,[3] the finest bay in the Red Sea. Its breadth from Ras Istahi to Ras Farājin is $4\frac{1}{2}$ miles. It recedes about the same distance from Farājin Island to the head of the bay. In the middle of the Bay is the Island of Bahdur, $2\frac{1}{4}$ miles long, $\frac{3}{4}$ of a mile wide, and 15 feet high, with the town of Akīk Kabīr. The length of Farājin Island (20 ft. high), including Shatira Island (10 ft. high), which is joined to it by a reef, is $3\frac{1}{2}$ miles. It is connected with Ras Farājin by a reef. The bay is thus protected by a natural mole. Fronting the entrance to the bay is a chain of sand and coral islands which effectually keep out all swell or sea. The entrance channel for ships between Guban Island (25 ft. high) and the Hajar Islands (20 ft. high) is from 3 to 11 fathoms deep, and between Ras Istahi and Shatira Island it is 5 to 7 fathoms deep. At its narrowest part it is four cables, or half-a-mile, wide. Round the island of Bahdur the depth is from 4 to 6 fathoms. South-west of the town there is a depth of 4 fathoms, while deeper water and more room can be had to the northward. The town of Akīk—Akīk Saghīr—is not on Khor Nowarat but on the neighbouring deep bay a little to the N.W. of it, and separated from it by a narrow tongue of land. Here, too,

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[1] *Petermanns Mittheilungen*, Ergänzungsheft No. xv. 1865, pp. 28-9.

[2] *Report on the Soudan*, 1883, p. 22. *Parliamentary Paper, Egypt*, No. 119, 1883.

[3] *Red Sea Pilot*, 1892, pp. 180-4; *Red Sea Chart*, Sheet 4, Inset.

there is a good haven, with a depth of 4 to 5 fathoms. Hence in making Akīk the port of the Upper Nile, there is a good haven with ample accommodation for vessels of any size and tonnage.

Now in order to estimate the relative merits of the Sawākin-Berber route and the route from Akīk to Goz Rejeb and Khartum, I may state that Lord Dufferin [1] in his report on Egypt deemed it desirable to have the line made, not to Berber, but to Shendi, and that Sir Samuel Baker [2] has criticised the line from Sawākin to Berber as only a half measure, and has shown the necessity of having it made to a point north of the sixth cataract, N. lat. 16° 20′, some 40 miles from Khartum. That is to say, the line will have to be made from Sawākin by way of Berber or Damer to Khartum if it is to be of full use commercially. The main reason for this is that the sixth or Shablūka Cataract, which is now historically associated with the voyage to Khartum in the Sudan campaign, is not navigable for several months in the year. I have therefore to point out that as soon as the line is made to Goz Rejeb, the port of Akīk is in direct communication with the Upper Nile by way of the Bahr-el-Aswad or Atbara, which is navigable from the end of June to the end of September, during which time the Shablūka Cataract is navigable.

In the beginning of my paper I said that a nodal point, or nodality, is a convenient term in describing and estimating different routes, the relative merits of which are decided by the importance of the nodalities which feed the highway of trade. Viewing Akīk, then, as a nodality on the highways of our foreign trade, I have to point out that there will come to it directly, if it is made the port of the Upper Nile, the whole of the trade from the Habab territory. From Akīk, too, there is a caravan route, the Darb-el-Kereb, up the valley of Khor Omeda to the Hagar highlands.

Between Akīk and Afafit, which is an important nodality for the Tokar district, there is cultivable land along the route through the territory of the Beni Amr, Ashraf, and Artegha tribes. The Tokar district is very important strategically as well as commercially. In 1884 Commodore Molyneux [3] described it as the granary of the Eastern Sudan and the key of the position. In 1886 Mr. D. A. Cameron,[4] then Consul at Sawākin, said that Tokar, not Sawākin, was the key to the Eastern Sudan. According to Mr. Wylde, Tokar is healthy from September to April. The cultivable land of the Tokar district is estimated at 125,000 acres in a Parliamentary Paper of 1887,[5] 25,000 of which are cultivated. By others the cultivable portion is estimated at 300,000 to 500,000 acres of good arable land, well fitted by soil and sky for the growing of cotton. It is inundated by the Baraka during the Kharīf, or rainy season. The cotton is planted in September, and the whole crop is gathered by the

[1] *Parliamentary Paper, Egypt*, No. 6, 1883, p. 70.

[2] *The Egyptian Question*, p. 69.

[3] *Parliamentary Paper, Egypt*, No. 35, 1884, p. 19.

[4] "Tribes of the Eastern Sūdān."—*Journal of the Anthropological Institute*, vol. xvi. p. 293.

[5] *Egypt*, No. 2, 1887, p. 44.

middle of February. It has a fine and long staple, and commands the highest price. In fact, as soon as the line is made from Akīk to Afafit the trade of this district will make it pay by freights and fares. To Tokar as a nodality there will also come the trade of the Beni Amr tribes from the valleys of the Anseba and the Baraka.

The district of Filik resembles that of Tokar; its soil is fertile, and it is inundated during the Kharif by the Gash. It is also an important nodality where several trade routes meet on the main caravan route from Kasala to Sawākin. From Filik a branch line of some 40 to 50 miles will be demanded by the strategical and commercial importance of Kasala, which will tap the districts of Sabderat and Daga as well as the provinces of Gadārif, Galabat, and Senaār. It is hoped in Italy that the line from Masowa will tap these districts. But according to a report in 1885 by Consul Baker, little of this Sudan trade found its way by caravan to Masowa. The caravan highway from Kasala and from Gadārif, Galabat, and Senaār through Kasala is to Sawākin, and if the line is made from Akīk to Goz Rejeb, with this branch to Kasala, the whole of the trade from Kasala will in all probability come to the port of Akīk. The length of the line from Masowa is announced as 300 miles, and the line from Akīk to Kasala will be about 280 miles. The weight of this trade from Kasala is decisive as between the Sawākin-Berber route and the Akīk to Goz Rejeb route.

Goz Rejeb is the main nodality on the direct line between Akīk and Khartum. Freights and fares will come to it by trade routes from all parts—some from Gadārif and Galabat, some from Abu Haraz and Kamlin with the trade of Senaār, Fazogl, and West Abyssinia; some from Khartum with its trade from all parts. In fact as soon as the line is made to Goz Rejeb the trade of the whole Upper Nile basin can come to it by ship and caravan.

Goz Rejeb,[1] therefore, is of cardinal importance as a nodality on the highway of trade from the Upper Nile to the port of Akīk. In one respect there is a great contrast, the importance of which will be at once recognised, between it and its rivals Berber and Kasala; it is a very healthy town. Munzinger[2] in a topographical note of 1862 speaks of its good site and good air and of its freedom from fevers. Rokeby[3] in 1871 assigned it the foremost rank as a sanatorium in the Sudan.

But the highway of trade is from Akīk to Khartum. The line will be made to terminate at Hojāli or Khojāli on the Bahr-el-Azrak opposite Khartum, between which and Goz Rejeb the route is through good level pasture land.

The strategical and commercial importance of Khartum is universally recognised. In a Parliamentary Paper, Egypt, No. 2, 1887, the cultivable land in the province of Khartum is estimated at 14,000,000 acres. Most of it is good land for growing cotton. In 1883 Colonel Stewart described Senaār, Karkoj, and Gadārif as the granaries of the Sudan, and as cele-

[1] *Gōz* (*Koz* or *Qoz*) is used in the Sudan as a general name for a town or village built on an elevated site in a sandy plain.

[2] *Petermanns Mittheilungen*, Ergänzungsheft No. 13, 1864, p. 22.

[3] *Journal of the Royal Geographical Society*, 1874, p. 162.

brated for their corn-growing capacity. He showed that as soon as the line is made to Khartum there will be a considerable trade in grain to meet the demands of the coast and Arabia.

But the importance of Khartum as the dominant nodality of the Upper Nile lies in the immense possibilities of canotage,[1] with the Nile as a navigable highway. From Khartum to Fazogl there is the canotage of the Bahr-el-Azrak, which is navigable to Famaka, a distance of some 350 miles. By way of Abu Haraz there will come the trade of the fertile district, consisting of some 3,000,000 acres of good land, between the Rahad and the Dinder, of Gadārif and Galabat, of Senaār, Karkoj, Rosaires, and Fazogl. By this route there used to be considerable trade with the west of Abyssinia and the basin of the Abai to Gojam. It is probable, too, that there is a feasible highway of trade from Famaka up the valleys of the Tumat and the Yabus by way of Fadasi to tap the Galla lands and Kaffa. It is some 490 miles from Bonga in Kaffa to the port of Zeila by way of Harar, some 630 miles to Masowa by way of Sokota, and some 650 miles to Asab.[2] It is for the future to show if the trade of these Galla lands will come to the ports of Italy at Masowa and Asab, of France at Obok and Jibuti, or of England at Zeila and Berbera. But in view of the trade from Famaka by way of Beni Shangal and Fadasi there can be no doubt that a good deal of it will come to Akīk by way of Abu Haraz and Khartum. There is, however, another route by way of the Nile to tap these Galla lands and Kaffa. The Sobat is navigable for 150 miles, all the year, up to Nasr, and for 300 miles (according to Colonel Long[3]) for most of the year. Hence there is canotage for 700, if not for 900 miles, from Khartum to the lands in the basin of the Sobat and of Western Ormania or Gallaland. The Bahr-el-Ghazal and the Jur are navigable during more than half the year for some 400 miles, and the Bahr-el-Arab for some 500 miles.[4] The nodality of the Bahr-el-Ghazal districts is Meshra-er-Rek, where trade routes meet from all parts, and from which canotage is possible on the many tributaries of the Bahr-el-Ghazal, to tap the whole of this fertile province, which is five times as large as England. The Nile itself—the Bahr-el-Abyad and the Bahr-el-Jebel—is navigable from Khartum to Kiri, a distance of 1068 miles. From Beled Hajir and Jebel Rojau, some 40 miles north of Khartum, to Jebel Rejaf and the Isle of Beden, 1040 miles south of Khartum, there are no rapids or cataracts. Between Rejaf and Kiri there come the rapids at Beden for about half a mile, but these have proved easily navigable, and it is probable, as Gordon recognised in 1878, that the direct navigation of the Nile from Khartum will terminate at Kiri, which will thus become the nodality of the Bahr-el-Jebel districts.

Kiri, according to the account of it by Gordon, is a fine district. It is thought by some that the Nile can be made navigable to the Asua, in

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[1] As cabotage is the received term for coasting trade, and there is need of some convenient term for inland navigation trade, whether it be the traffic of river, canal, or lake, I make use of the term canotage, which has met with authoritative approval.

[2] Stanford's *Africa*, vol. i. p. 511, ed. 1895.

[3] *Bull. de la Soc. de Géographie*, Paris, October 1875, p. 351.

[4] *S.G.M.*, vol. i. p. 237.

which event there are only 10 miles where all navigation is doomed by the formidable rapids at the Fola Falls. Taking Kiri, however, as the district where navigation ceases from Khartum, there is need of a line of railway from Kiri to Dufli or its vicinity, a distance of some 50 miles. Gordon made his line of garrisoned posts on the left bank for strategical reasons, but a line of railway will probably take the right bank, and in all probability it will terminate, not opposite Dufli, but a few miles to the north at the mouth of the Unyama, where will arise a great port which will be the dominant nodality for the whole of the Upper Bahr-el-Jebel, as well as for many other districts, such as Irenga, Turkan, and Lango to the east of it; Kalika and Mombattu to the west of it. From this point the Nile is navigable to Magungo and the Murchison Falls, a distance of 150 to 160 miles, whence will come the trade of Unyoro and the districts of the Victoria Nile to the west of Mruli. To this port there is a feasible highway of trade for the districts in the basin of the Albert Lake, which is 90 miles long, the Albert Nile, and Lake Albert Edward.

But the line of railway from Kiri will probably be continued up the valley of the Unyama some 50 miles to Fatīko, which is the finest district in the basin of the Bahr-el-Jebel and the Lakes. Baker spoke of it as a Paradise. Emin and Felkin have described it as the granary of the whole district between Dufli and Mruli. From Fatiko a line of some 70 to 80 miles will be made to Fauvēra on the Victoria Nile, which is navigable from Fauvera to Urondogani, some 160 to 180 miles. Thus, by a line of railway from Kiri to Fauvēra, some 160 to 180 miles through an easy country, the navigable part of the Victoria Nile can be brought into commercial relations with the navigable part of the Nile between Khartum and Kiri. Thus there is a feasible highway of trade for Lango, Usoga, Unyoro, and Uganda.

I have now stated the case for the port of Akīk as between it and Alexandria, Sawākin with Sheikh Barud, and Masowa. I have now to state the case for the highway of trade from Akīk to Kitāra, or the Lake districts, as between it and Mombasa and Chinde.

Now it is reasonable to assume that none of this trade between Khartum and Kiri can find its way normally to Mombasa, and it is highly probable, from the topography of the Bahr-el-Jebel basin, as well as from the organisation of the province in the time of Gordon, that the whole of its trade will come normally to the canotage of the Upper Nile.

It is in the lands of the Albertine basin where the highway of trade from Akīk meets the possible highway from Chinde. The port of Chinde is some 20 miles from Foot Point. The ascent of the Zambesi and Shiré can be made to Katunga, a distance of 290 miles from the sea. From Katunga there is a road by way of Blantyre, about 60 miles in length, to Matōpe, above the Murchison Rapids. From Matōpe there is a navigable way to Karonga at the head of Lake Nyasa, a distance of some 400 miles. From Karonga to Kitūta, on Lake Tanganika, the distance is some 240 miles. The length of Tanganika affords some 400 miles of navigable highway. According to Mr. Scott Elliot, it is some 60 or 80 miles from Tanganika to the navigable channel of the Kagera

in Urundi or Bugufu. Hence the line of communication from Chinde consists of some 1100 or 1200 miles of canotage and some 400 to 500 miles of caravan, or, according to the estimate of Mr. Scott Elliot, 460 miles of rail. According to the Secretary of the African Lakes Corporation, the current rate of freight from Chinde to the Blantyre district of the Shiré Highlands is £8 a ton, and the through rate from Chinde to Tanganika is £85 a ton. As it costs from £250 to £300 a ton to send goods from Mombasa to Mengo, an attempt might well be made to test the feasibility of this route from Chinde to Kitara. From Akīk to the head of the Albert Lake it is some 1260 to 1280 miles of canotage and 500 miles of caravan or rail. According to an estimate of Gordon, writing to Baker from Khartum in September 1878, it would take not more than six weeks to arrive at the head of the Albert Lake from Sawākin. If the companies and agencies are afforded an opportunity of proving the feasibility of Chinde as a port, it seems therefore that the dividing line between it and Akīk is in the basin of the Semliki, or Albert Nile, and in the district of Ankole.

As between Akīk and the German ports, Tanga, Bagamoyo, and Dār es-Salām, the case is the same as that of Mombasa and Chinde. It seems, from the recent report of the German Commission, that the scheme for a line from Tanga to Speke Gulf has been set aside, and that it is deemed more feasible to make a line from Dār es-Salām by way of Tabōra.

Between Akik and Mombasa the dividing line or the meeting-point is in the basin of the Victoria Nile. The possibility of Mombasa as the port of the Upper Nile and the Lakes was recognised by Gordon in January 1875, as soon as he saw that the best parts of the Bahr-el-Jebel districts are the high lands near the Lakes. As a haven Mombasa is all that can be desired. From Mombasa to Mengo it is some 800 miles, and it takes an ordinary caravan from eighty to ninety days to cover the distance. According to the *Report* of Sir Gerald Portal (p. 38), if a line of 321 miles is made from Mombasa to Kikuyu, and vessels put upon Lake Victoria to run between Port Victoria and the port of Mengo, the transit will take from thirty-two to thirty-four days. The Government has now decided to make the line the whole distance of 657 miles. The time between England and Uganda is estimated from four to six weeks. From the Ripon Falls to the Isamba Rapids or to Urondogani, some 40 miles, the Victoria Nile is not navigable. From Jinja, on the Usoga side of the Nile, in the vicinity of the Ripon Falls, some 60 miles from Mengo, it is about 160 miles to Mruli. Hence it is nearly 900 miles by caravan and canotage from Mombasa to Mruli. Now, to arrive at Mruli from Akīk, two routes are possible from the Upper Bahr-el-Jebel. There is the canotage highway to Magungo, whence there is the caravan route by way of Kiroto ; the other is the caravan highway by way of Fatiko to Fauvera, whence there is the canotage highway of the Victoria Nile. In the spring of 1876, when at Dufli, Gordon estimated the time between Uganda and England at nine weeks. In 1878 the time from Sawākin to Mruli was not more than six weeks, and he had vessels at Khartum to put on the Victoria Nile between Fauvera, Mruli, and Urondogani. Hence, with 450 miles of railway between Akīk and Khartum, and 50 miles of railway from Kiri

to Fashelu or Dufli, the time may be estimated at two weeks from Akīk to Magungo, and at three weeks to Mruli, as well as to the head of the Albert Lake. But the recognised importance of the Fatiko district will demand a line of railway from Fashelu up the valley of the Unyama, some 50 miles, which may be continued 70 to 80 miles to Fauvera, whence there are 60 or 70 miles of canotage to Mruli. In that event, the time from Akīk to Mruli may be estimated at two weeks, which allows ten to twelve days, as in 1876 and 1878, for the voyage between Khartum and Kiri. Hence a probable estimate for the mails by this highway of trade through the north-east of Africa is a fortnight from Akīk to Kitara. And Akīk is some 3000 miles nearer England than Mombasa, directly on the main highway of our maritime trade with the East.

I have now stated the case for Akīk as the port of the Upper Nile, and for the highway of trade between it and Kitara. Now, in a leading article of the *Times*, September 23, 1890, when the future of Kasala was discussed by the representatives of Great Britain, Egypt, and Italy, it was stated that between Sawākin and Masowa there was no position on the coast that could be regarded as important either from a commercial or a strategical point of view. It is therefore assumed in Italy[1] that Great Britain will make a line from Sawākin to Berber and Khartum, and that there is room for a line from Masowa to Kasala and Khartum. It is hoped that the line from Masowa will tap the trade from the important and fertile districts of Senaār, Galabat, Gadārif, and Tākā, as well as the tract between the Bahr-el-Aswad and the Bahr-el-Azrak. But it is reasonable to assume from the probable effects of the line between Akīk, Goz Rejeb, and Khartum, which, with its line of 40 to 50 miles from Filik to Kasala, will tap the whole of this trade, that it will be speedily recognised that there is no necessity for the line from Masowa, even if it were proved feasible. By the treaty of 1891,[2] Italy was granted the right, in case of strategical necessity, to occupy Kasala and a defined tract up to the vicinity of Goz Rejeb. As soon as it is recognised that Masowa cannot compete with Akīk as the port of the Upper Nile, Italy will be able to dedicate her energy and enterprise with no divided aims to improving her commercial relations with Abyssinia and Shoa by making a line from Masowa to Asmara, Adowa, and Sokota. In dealing politically with Abyssinia, she has in her hands the ample boon of the province of Bogos and the port of Masowa.

As the time seems to have come for Great Britain to make a strategical move towards the pacification of the Upper Nile, the consideration here of this highway from Akīk may prove timely. There is no notice of it in Lord Wolseley's Minute of the 8th April 1884 on the routes to Khartum and to Shendi as a fighting base. If the importance of Tokar had been recognised it would hardly have been vacated after General Graham's victory in the spring of 1884. In his reports to Admiral Lord John Hay, Commodore Molyneux writes :—"No doubt Agig and the

[1] *Bulletino della Sezione Fiorentina della Società Africana d'Italia*, Dec. 1894, pp. 74-5.
[2] Hertslet's *Map of Africa by Treaty*, pp. 667-8.

island of Bahdur, where the inhabitants are now living, are at present unimportant, but the harbours are good, and, the fertile district of Tokar being in the neighbourhood, they may some day be of more value" (July 14, 1884).[1] "With Tokar, Kasala, and the coast held by the English, the Hadendowas could not live, Tokar especially being the granary of the Eastern Sudan and the key of the position" (4th October 1884).[2] To show the nature of the route between Tokar and Filik through the Hadendowa highlands, it will suffice to say that of the four caravan routes between Kasala and Sawākin, the most frequented is that by way of the Ermenab valley,[3] where the supply of fodder and water is plentiful. Hence Akīk, with its good line of communication, may well afford a good base for any effort to pacify the Upper Nile.

If Akīk becomes the port of the Upper Nile, its twin havens of Khor Nowarat and the deep bay to the north of it can afford ample accomodation for any of the vessels on the main highway of our maritime trade with the East. As a port of call it will soon prove the nodality for the whole of the Red Sea trade, and become the main mart for the coasting trade with the tribal ports of the Bejas, from Mersa Halaib to Mersa Mubarak, as well as with the ports of Arabia. Hence, with the canotage of the Upper Nile and the cabotage of the Red Sea, it seems high time to recognise the importance of Akīk in relation to the highways of our foreign trade.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The late Joseph Thomson.

At a Meeting of Council, held on October 10th, the following resolution was adopted:—"That the Council, in tribute to the memory of Joseph Thomson, desires to express the regret of his countrymen at the loss of a Scotsman whose world-wide fame as an African explorer, distinguished by the thoroughness of his pioneering work, and his humanity to the natives in its prosecution, entitles him to the lasting honour of his country and a permanent place on the roll of great geographical travellers."

Corresponding Societies.

It was announced at the same Meeting that the Royal Geographical Society of Australasia, Sydney, and its Victorian Branch had accepted the invitation to become Corresponding Societies in terms of the resolution of March 27th, 1893, and had granted reciprocal advantages to the members of this Society.

Alteration of Laws.

At a General Meeting of the Society, held on October 23rd, it was decided "to suspend the first clause of Law xxvi. as amended by the General Meeting of

[1] *Parliamentary Paper, Egypt,* No. 35, 1884, p. 9. [2] *Ib.* p. 19.

[3] "Die Karawanenstrassen zwischen Suakin und Kassala." von Josef Menges.—*Petermanns Mitt.*, 1887.

23rd January 1890" (whereby new Members were required to pay an Entrance Fee).

Law XXXVI. was also amended, so as to read as follows :—

"XXXVI. The Council may confer the Diploma of Fellowship :—(*a*) *Without Fee*, on distinguished Travellers or Geographers, on Honorary and Corresponding Members of the Society, or on other persons, whether members or not, who have rendered special services to the Society ; (*b*) *On payment of a Diploma Fee of One Guinea*, on Ordinary Members who satisfy the Council that they deserve the distinction, and who have paid a Composition for Life-Membership, or the Annual Subscription for at least three years preceding, or an equivalent amount. Members desiring the Diploma must apply for it in writing, and must furnish the Council with evidence of their qualifications."

Opening of Rooms in Glasgow.

An agreement has been entered into by the Glasgow Branch, whereby a room has been obtained on lease from the Philosophical Society, 207 Bath Street, to be used as headquarters of the Branch. The use of a hall for lectures has also been acquired.

The New Session.

At Edinburgh the Anniversary Meeting will be held on November 5th, in the Synod Hall, Castle Terrace, when Captain Lugard, C.B., D.S.O., will deliver an address on West Africa.

The Glasgow Branch will inaugurate the New Session on November 7th. Mr. J. Theodore Bent will lecture on Southern Arabia.

Captain F. E. Younghusband will deliver the opening addresses at the Dundee and Aberdeen Branches, on November 14th and 18th respectively. His subject will be Chitral.

On November 8th Mr. Bent will deliver a lecture to the Society in Edinburgh.

The Annual Business Meeting will be held in the Society's Hall, Edinburgh, on Friday, Nov. 15th, at 3 p.m.

New Members.

Members are requested to make an effort to increase the efficiency of the Society by obtaining new members. A Form of Application is sent out with each copy of this month's *Magazine*.

List of Members.

A List of Members is now ready, and may be obtained on application at the Society's rooms.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

The Southern Limit of Glaciation in Russia.—The botanists were the first to inquire into the limits of glaciation in the Government of Moscow. They found that on the high northern bank of the Oka, which enters the Volga near Nizhni Novgorod, forms occur which are not indigenous to the country, but have come

from land much farther south. These forms are confined along the northern bank to a narrow belt, and are absent on the east and west along the same parallel. An explanation was sought in the fact that the Oka rises some 3° farther south than the boundary of the Moscow Government, whence, it was supposed, seeds and germs were carried down by the stream and deposited where the plants are now found. But it was objected that, if such were the case, there was no reason why these plants should be restricted to the border of the Moscow Government, and not occur also in the Riazan, where the conditions are still more favourable, as the river there turns to the south again. Then the formation of the ground and composition of the soil on the bank of the Oka was supposed to be more favourable to the growth of the plants. The terraced contour of the land, and the possibility of greater insolation, etc., were appealed to.

Next, the commission for the investigation of the fauna of the Government set to work in 1891, and devoted special attention to the district in question. It was then discovered that the fauna showed a similar peculiarity of distribution to the flora, forms being discovered on the northern bank of the Oka (particularly spiders and beetles) which are properly inhabitants of more southern tracts—in the Governments of Kaluga, Tula, and Orel. These insects also are confined to the bank of the Oka where it forms the boundary of the Moscow Government to about two or three miles north of the river, and are not found to the east of Kolomna or west of Drakino (a village about seven miles west of Serpukhoff). Nor are they found in any other part of the Government. This localisation in a narrow belt skirting the river is particularly marked in the case of spiders, and hence Herr Freiberg was induced to reject the theory of the botanists and to search for other explanations. On examining the latest geological works, he found that the line deduced from the most recent investigations as the southern limit of glaciation coincided with the northern limits of southern forms of insects. Those forms, therefore, occur where they lived during the Glacial Period, as here they find, along the edge of the once glaciated area, suitable nourishment. Those geologists also who maintain that the limit of glaciation was situated in this neighbourhood, though erratic blocks extend somewhat farther to the south, find a confirmation of their view in this entomological fact, for that these forms are not immigrants is proved by their absence at the present day from the adjacent districts, which were covered with ice, but are now equally suited for their existence. A sketch map in the *Deutsche Rundschau*, Jahrg. xviii. Heft 1, shows the limit of glaciation running northwards to a point a little west of Kaluga. It then turns north-eastwards, leaving Serpukhoff and Kolomna a little to the right, and turns southwards through Riazan.

The Vistula.—In 1888 a sum of one million sterling was voted by the Government for the regulation of the mouth of the Vistula, the object being to provide a suitable passage for the ice, as the Nogat is quite inadequate. The bed of the river from above the Elbing arm has been shortened from $10\frac{1}{2}$ to $4\frac{1}{3}$ miles, and carried direct to the sea, with a slight convexity towards the west, while the dam on the left bank has been carried back for a length of $5\frac{1}{4}$ miles, whereby the section at high-water has been doubled in breadth. The ground being of alternating layers of clay, sand, and mud, it was considered that the erosion of the river would not excavate a new bed quickly enough, and therefore the full breadth of the channel was dredged out to a depth of $6\frac{1}{2}$ feet under mean water-level, but among the sandhills a breadth of 165 feet was estimated to be sufficient. In March 1895, during high water, caused by the ice and spring thaw, the new channel was opened, and by the next morning the water had enlarged the breadth of the channel to nearly 1000

feet. In sixteen hours the stream carried more than seventy million cubic feet of sand into the sea, whereas seven dredges had never been able to clear away more than 672,000 cubic feet in a day. In May a dam at Bollenbude was closed, and the Dantzig branch thereby cut off from the Vistula, and thus an end was put to the anxiety which the citizens experienced at every break up of the ice and at high floods.—*Annalen der Hydrographie*, Heft. vi., 1895.

The Caspian Sea.—According to M. Akinfieff, the sea has diminished during the last century by an area of about 3900 square miles. On receding, it has left behind sands which quickly dried under the hot sun, and the wind raises the upper layer, sometimes even from cultivated ground, and carries it away. In two or three days a layer, four to five inches thick, of light soil has been blown away from fields ready for sowing over an area of four or five hundred acres. This movement of the soil has threatened the existence of the line from Rostoff to Vladikavkas, which has had to be protected. The dust has accumulated at the foot of the barriers to a height of twenty or thirty inches.—*Mouvement Géogr.*, Sept. 29th.

ASIA.

Mustagh-ata.—It may be remembered that Dr. Sven Hedin made last year several attempts to reach the summit of Mustagh-ata, the highest mountain on the whole Pamir plateau, which rises, covered with snow and ice, to a height of about 25,000 feet above sea-level. On the east the Pamir plateau is bounded by two parallel meridional chains, the Sarik-kol and the Mustagh, or, as it is also called, the Kashgar chain. Though the inner chain of the two, it is the Sarik-kol which forms the watershed separating two river basins, the farthest bounds of which, the Sea of Aral and Lob-nor, lie at a distance of 30° apart. The Mustagh, being included in the Tarim river district, is more developed and exhibits wilder forms than the Sarik-kol. The watercourses running eastwards must pass the Mustagh-ata to reach their destination, and the Yarkand Daria, the largest stream of the basin, the Gez Daria, and the Markan-su actually break their way through the chain by deeply cut transverse valleys. The average height of the ridge of the Sarik-kol is far less than that of the Mustagh chain, but the average heights of the passes is probably the same in both ranges.

The Mustagh chain, on account of its situation and greater height, is more exposed to the moisture brought by the southern winds than the Sarik-kol, which, at least in the parts visited by Dr. Hedin, has no glaciers and very little perpetual snow. On the eastern slopes, facing the dry climatic district of Eastern Turkestan, the Mustagh has few glaciers, which are all the more plentiful on the western side. This grand glaciation doubtless protects the range from weathering, while the Sarik-kol chain, rising in a dry air, has lost its mantle of ice and has rapidly decreased in height. Perhaps in ancient times it rivalled the Mustagh-ata. On the latter, too, the extent of glaciation has much diminished, as is shown by the morainic *débris* which covers the lower slopes and in places blocks up the Sarik-kol valley. One of these moraines has stretched across the valley and dammed it up, forming the Little Kara-kul and the two basins called Bassik-kul, and probably the lakes Chakeragil and Balun-kul have been formed in the same manner. Erratic blocks, 1000 cubic mètres in volume, are by no means uncommon. During last summer on the culminating point of the chain, often erroneously called Tagharma, Dr. Hedin explored seven large and several small glaciers. From Bassik-kul alone twenty-one glaciers are visible on this chain.

Mustagh-ata, "the Father of Ice Mountains," is composed of gneiss of all colours and forms of structure, from coarse-grained and porphyritic gneiss to fine-grained,

with a transition to crystalline slate. Slate is predominant on the northern parts and gneiss in the south. The mountain is divided into two distinct parts, between which the Jam-bulak glacier, called by Bogdanovich the Przhevalski glacier, has its *Firn* and tongue. The main mass of the mountain, with its four summits, lies to the south, the northernmost being the culminating point. From the west it can be seen that these four summits, near their tops, gradually merge into a cupola, where the armour ice is fully developed and of enormous thickness. The larger glaciers generally end at a height of between 12,800 and 13,500 feet.

In ascending mountains it is not alone the rarefaction of the air, but also the physical exertion which brings on fatigue and decrease of strength. Muscular exertion requires a larger supply of oxygen, but the quantity of oxygen decreases the higher the climber ascends. To avoid this difficulty, Dr. Hedin had recourse to yaks, which are strong and tenacious. In one of the ascents he made, these animals climbed to a height of 19,500 feet without apparent exertion.

On April 17th, 1894, Dr. Hedin set out with six Kirghiz to make an attack on Mustagh-ata from the western side. The ascent was steep, and the whole ground covered with ice blocks and ancient moraine heaps. On the 18th he arrived at the northern marginal rocks of the Jam-bulak glacier at a height of 16,000 feet. The glacier issues from a deep and broad fault which divides the mountain, as already mentioned, and in three places has deep falls which form whole systems of deep transverse crevasses. After issuing from the rocky passage, the glacier spreads out to thrice its former width ; but even here there are crevasses sixty feet deep. At a height of 15,150 feet a depôt was formed, where water boiled at 180·14° F., and the temperature sank to 24° F. From this height Dr. Hedin was obliged to return, the weather being unfavourable. Later in the year a permanent depôt was established below the former camp at a height of 14,400 feet, where the Sarik-kol valley and the nearest chains of the Pamir formed a splendid landscape. In August Dr. Hedin made another attempt, passing the snow-line at a height of 16,350 feet, and reaching an elevation of 19,450 feet. Here a steep slope gradually spreading out to the flattened cupola of the top was covered with snow, which showed a tendency to form avalanches. During the following days three of the largest glaciers, the Chal-tumak, Tergen-bulak, and Chum-kar-kashka, all flowing to the were explored. Then another attempt was made along the south side of the first mentioned glacier, where at a height of 18,750 feet a huge crevasse barred further progress ; and a fourth attempt was not more successful. Dr. Hedin concludes that the probability of reaching the summit of Mustagh-ata is very small, for the snow is two feet deep and more, and the ice forms enormous blocks and protuberances, intersected by broad and deep cracks often concealed by snow. Many of these cracks can be crossed only by ice-ladders, and it is hardly possible to carry these at such a height, however light they may be made.—*Geogr. Journal*, Oct.

The Kolyma Region.—The valley of the Kolyma is inhabited by isolated groups of Russians, who have partially lost their national character among the Yakuts, Lamuts, and Chukches. The chief centres of population are Verkhne, Sredne, and Nizhne (Upper, Middle, and Lower) Kolymsk, which certainly do not deserve to be called towns. In the first only nine persons live, and the forty Russian citizens who are returned in official reports as living in the neighbourhood have lapsed into barbarism, and wander about with reindeer in the wildest tracts. Sredne-Kolymsk is the capital of the territory, and consists of twenty or thirty small roofless huts scattered along the left bank of the Kolyma, and both banks of the small stream Ankulin. Nizhne-Kolymsk is in much the same condition, but the

inhabitants have retained the Russian language and are proud of their origin, though in physical formation they have much degenerated. The inhabitants of Sredne-Kolymsk live by fishing. The season commences late in the summer, and by March all the supplies are consumed. The people are then obliged to resort to dogs, fish-bones, and other offal, and in May they are reduced to scraps of leather, straps, and the skin of a fish which is used to cover the windows. At the beginning of July the ice breaks up and their privations are over. But the fish diet is not without danger, for, salt being scarce, the fish soon decay.

Physical degeneration is accompanied by mental. The memory becomes weak, and reading, if acquired, is soon forgotten. Some grown-up persons can count only up to thirty-nine, and for higher numbers say thirty and ten, thirty and eleven, etc. The language in use is the Yakut, and the Russians have also adopted some of the religious notions of this people, believing in four gods dwelling at the four corners of the heavens.

The most northern point inhabited by Russians is Sukharnoie, six miles from the Arctic Ocean, a wretched and dismal settlement. On the right bank of the Kolyma stand five or six huts built of driftwood, about ten feet square, and so low that a tall man cannot stand upright in them, and with a door which must be entered on all-fours. The inhabitants wear no linen under their fur clothes, and their language consists of about 200 words; most of them can count up to ten. In a still worse plight are the natives, being an easy prey to enterprising traders who sell them tea, tobacco, and doctored spirits at extortionate prices. Another evil is the presence of convicts, who are sent to this region because they have committed unusually heinous crimes. Roads alone can improve this unfortunate country. At present the journey from Sredne-Kolymsk to Yakutsk takes fifty days, and Verkhoiansk is the only inhabited place on the route.—*Deutsche Rundschau*, Jahrg. xvii. Heft 12.

The Transbaikal Region.—A description of this region extracted from an article by M. Khoroshkin is published in *Petermanns Mitt.*, Bd. xli. No. 9. The country lies to the west of Lake Baikal, between latitudes 49° 54′ and 57° N., and between long. 102° 38′ and 119° 27′ E. On the north and west it is bounded by the Government of Irkutsk and the Yakut territory, of which nothing is known. To the south and east it borders on Chinese territory. Its area is about 237,000 square miles. The whole country is a rather high tableland, traversed from north-east to south-west by the Yablonoi mountains. Their south-eastern edge is steep and abrupt, whereas their north-western boundary is very inconspicuous. Transbaikalia is divided by this range into two parts. In the western part the pass across which the post road runs has a height of 3600 feet, the elevation of Kiakhta is 2600 feet, and of Lake Baikal 1700, and therefore the difference of level from east to west—from Kiakhta to Lake Baikal—is about 900 feet. In the eastern part the height of the Ingoda at Chita is 2200 feet, of the Onon at Aksha 2328, of Abagaituiefski, at the entrance of the Argun into Russian territory, 1800, of the confluence of the Argun and Shilka 1000. Accordingly from Chita and Aksha to the Amur there is a fall of about 1200 feet. Subsidiary ranges, with a relative height of 2000 feet, cross Transbaikalia in all directions. The valleys are deep and generally narrow, though occasionally attaining a breadth of twelve miles. At the sources of the Ingoda, Transbaikalia reaches its culminating point in the Sokondo, 8000 feet high. Northwards the elevation of the Yablonoi mountains gradually diminishes, being near Chita only 4000 feet. In the western division rise the rivers Khilok and Uda, tributaries of the Selenga and the Konda, an affluent of the Vitim. The valleys of the two former, and those of other streams in this region, slope gradually

westwards and are accompanied by mountain ranges. From the south extend the branches of the Kentei mountains, and the continuation of the Saian mountains, known as the Khangar-ul and Khamar-daban, skirt Lake Baikal and have summits 6000 feet high. In the eastern division the ranges are lower, rising up to 3000 feet only. Here, too, the mountains are bare and of gentler outline, so that the country gradually assumes the character of a wide, hilly, and treeless steppe.

The rivers all belong to the drainage basins of the Yenisei and Lena or the Amur. They are true mountain streams, of changeable volume, and with considerable fall and rapid current. In winter, when frozen, they form a convenient pathway, but at other times are difficult to cross. At the end of April the ice breaks up; at the end of October the rivers are frozen over and often solidified to the bottom. Lake Baikal is very deep, and has fresh and very cold water; its greatest breadth is 56 miles and its least 28. Its banks are in most parts difficult of access, as the surrounding mountains often descend precipitously to the water. Six small steamers ply on the lake and up the Selenga, and in favourable weather cross from Listvinichnoie to Mysovaia in six or seven hours. The season of navigation lasts from May to December. In winter the traffic is carried on over the ice, or by the shore road. Besides the Baikal there are the lakes Gusinoie, Eravinskoie, Shakshinskoie, Bauntofskoie, and others in this region.

The climate is thoroughly continental. Especially remarkable are the changes of temperature, even in a single day. In Chita, for instance, the daily range in summer and spring is often as much as 33° to 46° F. In December, in the central parts of the district, it is no uncommon thing for quicksilver to freeze even in the daytime, and the thermometer falls to − 58° F. But the dryness and rarity of the air renders the cold endurable, especially as even in winter the sun is warm. The prevailing north and north-west winds are always cold, and the south-west winds bring rain. Storms are not infrequent. Spring begins at the end of March, when it is already warm at midday, but vegetation does not make its appearance before the end of May. Spring passes almost insensibly into summer, which is warm and often very dry, and therefore not conducive to the growth of grass and corn. As early as the middle of August the thermometer falls below freezing point in the night, and snow begins in September.

The mineral wealth of the region has not been thoroughly investigated. There is gold in all parts, silver in the Dauer mountains, and copper, lead, zinc, iron, and mercury in various places, as well as coal and salt. The vegetation is monotonous. Half the country is covered with forest, though a good deal of land has been already cleared. The chief varieties are Scotch fir, larch, aspen, poplar, birch, in the south cedars, and in the north *Abies pectinata*. Fruit-trees are rare; a few apples and sorbs are met with. In the large forests live bears, wolves, foxes, sable, roedeer, elk, reindeer, goats, bisons, wild boars, and squirrels. Fish is scarce. Fifty mineral springs (sulphur, iron, and soda) are known.

The population is chiefly congregated to the south of 52° N. lat., being densest in the valley of the Selenga below Verkhne-Udinsk, on the middle Khilok and Chikoi, on the Kuitun, Ingoda, Shilka, Uda, Gazimur, and Middle Argun. There are seven towns—Selenginsk, Bargusin, Troitskosavsk, Verkhne-Udinsk, Chita, and Aksha. The population consists of 177,000 Cosacks, 166,660 Russian peasants, 170,000 natives (Buriats chiefly, and some Tunguses), and townsmen, troops, and convicts. Of the last, 2200 were transported annually in the years 1888-1891. Some of them are confined to prisons, while others live in buildings connected with the prisons or in their own houses. Both classes work at the mines, the erection of prisons and other buildings, and in other employments. When their sentence is worked out, they are distributed among the districts of the Government, and after

ten years' good conduct, may settle down as ordinary peasants. The number of convicts is supposed to be about 16,000, including both sexes.

The principal occupations of the inhabitants are agriculture and grazing. Of less importance are the extraction of gold, fishing, transport of goods, and hunting. About two-thirds of the whole country are useless for cultivation. The other third has an area of about 80,150 square miles, of which about 6330 are tilled. Agriculture is the chief occupation of the settled population; only in the south-eastern part of the territory, on the high plateaus where drought and unfavourable climatic conditions are obstacles to other occupations, is grazing pursued. In the southern districts wheat, rye, barley, pease, and potatoes are grown—all summer crops, for winter crops would be frozen. Grazing is on a large scale; in 1892 there were 2,700,000 head of cattle, and the number of horses was 500,000. Of late camels also have been used for the transport of goods. Gold has, especially in the last twenty years, been extracted in considerable quantities, chiefly on the Chita, Uda, Vitim, and their tributaries. Iron has been worked for the past hundred years at Petrovsk, not far from the Khilok. Fish are caught at the mouths of the Selenga, Bargusin, and Angara, and in Lake Baikal.

Two main roads pass through Transbaikalia; the most important is that from Pekin through Kiakhta to Irkutsk, and the other runs from the Amur to the same terminus. There are also post roads with an aggregate length of 1270 miles, with telegraph lines running beside them; but many important centres of population have no postal communication.

Frozen Soil in Siberia.—In the *Meteorologische Zeitschrift*, Heft 6, 1895, M. Voeikoff treats of the extent of the frozen land in the Russian territory. The surveys lately made in connection with the Siberian Railway have proved that permanently frozen soil is very common in Transbaikalia, though, for the most part, it is of no great depth. The Khamar-daban, which skirts the eastern shore of Lake Baikal, is an exception, for in spite of its great elevation no frozen ground is found on it, and the observations of the surveyors are confirmed by the fact, that even in winter the streams and brooks in these mountains bring down enough water to keep the mills in full activity, while in the greater part of Transbaikalia they are stopped for five or six months in the winter half of the year. In the mountains snow begins to fall at the end of September or the beginning of August, and protects the soil from the cold, whereas in most of the region little snow falls. While in the neighbourhood of the Ob and Yenisei canal, on a very cold watershed between the Ket, a tributary of the Ob, and the Kass, flowing into the Yenisei, at 59° N. lat., the ground is not frozen, though the mean temperature is 26½° F., it is congealed in some parts of the northern forests of the Yenisei basin; here the mean temperature of the air is fixed by the mining engineer, Yateresky, at 23°. In the well between Krasnoiarsk and Mariinsk a ring of ice is often found ten to twelve feet below the surface of the ground, though the district, situated on the Yenisei at 56° N. lat., has a mean temperature of 33°. If such wells are not used, the water is covered with ice even in summer.—*Globus*, Bd. lxviii. No. 12.

Western China.—In 1890 Herr Arthur von Rosthorn made a journey up the Yang-tse-kiang, in the course of which he visited districts never before entered by an European. From Chung-king he proceeded by the Min river, the upper course of the Yang-tse-kiang, to Cheng-tu on the western edge of the Min plain. This large river rises in the Min mountains in the extreme north of the province of Sze-chuen, and is considered by the Chinese to be the main stream of the Yang-tse-kiang. At Kuan-hsien, north-west of Cheng-tu, it emerges from the mountains and divides into two arms, which in turn branch off into innumerable channels,

spreading to the south and south-east over the plain, which have been in part canalised for irrigation. The plain of Cheng-tu runs, like the streams, from north-west to south-east with a fairly rapid slope, for, according to Captain Gill (*The River of Golden Sand*), Kuan-hsien stands at an elevation of 2347 feet above sea-level, and Cheng-tu at 1504, so that the fall in the 30 miles between these towns is about 28 feet per mile. Cheng-tu is built in the form of a rectangle, 3½ miles long by 3 broad. Like other Chinese towns it is enclosed by a wall, which is nearly 36 feet high and 21 feet thick. It is a rich and important town, and the numerous halls, temples, and monasteries testify to the prosperity of the inhabitants. How many these are it is hard to say, probably not more than a quarter of a million. In spite of the neat appearance of the town and the apparent activity, the trade is small, the high tolls levied at the gates preventing the town from becoming a trade centre. Silk is manufactured and, of late, glass, needles, and matches have been made on the spot.

The town of Kuan-hsien stands against a mountain spur through which the Min flows by a passage that is undoubtedly artificial, and is said to have been constructed in the third century B.C. From this point Herr von Rosthorn turned westwards towards the Chin-chuan, or "Gold Stream," the upper course of the Tatu-ho. Though often represented on maps as an insignificant stream, it is really almost as large as the Min itself, a fact first mentioned by Mr. Colborne Baber (*R.G.S. Supp. Papers*, vol. i.). Crossing the Min, here 250 paces broad, just above Kuan-hsien, Herr von Rosthorn crossed a ridge 6000 feet high—the Yaotse-ling—and came to the source of the river San-chiang-ho at the foot of the Niutu-shan. The ascent of the mountain was steep and difficult, and on the crest the aneroid indicated 10,890 feet. A steep descent led down into the valley of the Wasse-ku, beyond which lay the next mountain chain—the Palang-shan. This range attains an absolute altitude of some 15,500 feet, and marks the boundary of the districts of Wen-chuan and Chin-chuan.

On the western side of Palang-shan the traveller came to the broad valley of the Chang-ping-ku, a stream of the Chin-chuan basin. The houses of the Mantse inhabitants are scattered over the slopes and valleys, while the Chinese, being merchants, innkeepers, or porters, keep close to the roads. At Mêng-ku the stream unites with the Little Gold Stream, and a little farther lies Mukung-ting, or Meilo, the capital of the district. The valley is very poor and thinly peopled. Crops, chiefly maize and buckwheat, are confined to a narrow strip of ground, for the mountains descend rather steeply to the river. Up on the flanks of the hills, however, are extensive plateaus where wheat is cultivated, as also in the side valleys. From Fupien, the highest military station in the valley, 10,800 feet above sea-level, Herr von Rosthorn marched westwards over the Hsi-ling chain into the valley of the Great Gold Stream. Leaving the highest cultivation at 12,500 feet, he passed through pine forest and over grassy land and then over snowfields to the rocky crest at an elevation of about 15,500 feet. On reaching the Chin-chuan at Hsüching he found it at least 750 paces broad. The valley is broad, and, being not too steep, is suited for the growth of wheat and other crops. The population is exclusively Mantse. At Chang-ku, Herr von Rosthorn left the Chin-chuan and travelled across an inhospitable country to Tachien-lu on the great route to Tibet, first visiting Taining. The route ran along the Hsi-ho, passing to the north of the imposing ridge of the Tapao-shan, and then crossed the Gata-liangtse by a pass about 13,500 feet high. Taining lies on the route to the Koko-nor, first traversed by the pundit A. K. in 1882.

The climate of the country between Cheng-tu and Tachien-lu is one of extremes, being very cold in winter and hot in summer. The rainfall is said to be consider-

able in the first half of the year, and hailstorms are frequent in summer. The most common rocks, especially in the higher parts, are granitic. Slates are also frequently met with, especially in the valleys, and compose some of the most sterile parts of the country. Conglomerates are plentiful, and contain the gold to which the district owes its name. The highest ridges, when not covered with snow, are seen to be chaotic masses of granitic blocks. Below the snowfields small pools are almost always found. Nearly all the rivers flow out of these glacier lakelets. They are often connected with a belt of peat, which is succeeded by pastures where in the summer herds of yaks and flocks of sheep feed. Then comes the forest zone, and at about 12,500 feet begins the zone of crops—chiefly barley, wheat, and buckwheat; in the lowest valleys maize is grown, chiefly by Chinese.—*Mitth. der k.k. Geogr. Gesells. in Wien*, Bd. xxxviii. Nos. 5 and 6.

AFRICA.

Meteorology of Eritrea.—In the *Boll. della Soc. Geogr. Italiana*, Fasc. viii., Signor F. L. De Magistris has given tables of meteorological observations at Massaua, Kassala, Keren, Ghinda, Assab, and other stations. At Massaua observations have been fairly regularly recorded since 1885, but the instruments, first placed at an elevation of five feet above sea-level, have been twice moved, and are now at a height of 64 feet. For the stations at Asmara and Keren, etc., the records available extend over about twelve months only, while those at Kassala are for eight months. The mean temperature at Massaua was 86½° F., the mean maximum 93°, and the mean minimum 80°. The absolute range was 47°, from 65° to 112°. The relative humidity was 65. Eleven and a half inches of rain fell on forty-three days. At Assab the figures for temperature do not greatly differ. On the whole the place is cooler, with a smaller range; the annual mean is 85°. The rainfall, however, is much less, being only 2½ inches, on five days in the year. Keren and Asmara, being at elevations of 4789 and 7708 feet respectively, have a cooler climate, and more rain. The mean temperature of Keren is 69°, and of Asmara 61°, but the absolute ranges are as high as at the lower stations. The rainfall is 29½ and 14½ inches respectively. The observations at Kassala, as far as they go, show that the temperature has a large range, namely, 66½°, while the mean from November to June was 85°, though the altitude is 1689 feet. Only half an inch of rain fell in the eight months.

Lake Zuai.—Of the expedition of King Menelik to this lake, which was reported on p. 88, some fuller details are given in *Globus*, vol. lxviii. No. 8, from a lecture by the Swiss engineer Ilg-Glattiker, who accompanied the expedition. The lake lies at about 8° N. lat., and has an area of 270 square miles. It contains five islands, of which and their inhabitants and hidden treasures wonderful tales have been current. The swampy shores have a treacherous covering of grass, and are also clothed with dense brushwood, so that considerable difficulty was met with in reaching the open water. Boats had then to be built to convey the troops to the islands. The islanders were frightened at the overwhelming force, and still more by the crack of the cannon, which King Menelik discharged at the numerous hippopotami, and made no resistance. On all the islands were churches in good repair, containing costly treasures, and more important still, a large number of ancient manuscripts, probably religious and historical. It may be safely assumed that these things were carried off to the islands about 400 years ago, when the Abyssinian Christians were hard pressed by the invading Mohammedans. The islanders, formerly Christians, have lapsed into paganism in consequence of their isolation, but have always guarded the valuables intrusted to them with super-

stitious reverence. All the treasures discovered the King left where they were, not wishing to excite the distrust of his new subjects. The Abyssinian men of literature are very eager to examine the documents, for the oldest compositions, which are known to have existed, are not to be found in the royal library.

AMERICA.

Mr. Peary in Greenland.—Mr. Cyrus C. Adams has kindly sent us a cutting from the New York *Sun*, containing Mr. Peary's narrative of his last journey across Greenland. In September last year he was left by the *Falcon* at the Petawak Glacier, and the third night after encamped at the head of Olriks Bay, where he procured a large supply of game, with which he returned to his winter quarters, Anniversary Lodge, Bowdoin Bay. September was cold and stormy, and when the caches of provisions on the ice-cap were looked for, they could not be found, being buried under three and a half feet of snow. The sun was seen for the last time on October 23. During the remainder of that month and November the stock of meat was added to, several short trips were undertaken, and plans made for the summer expedition. In the moonlight days of December, Mr. Peary, accompanied by Mr. Lee, made a sledge trip to Cape York. On the way back they were delayed by storms and their provisions ran short, necessitating a forced march of forty-six hours without food or sleep, from Saunders Island to the Lodge. During January also a five days' trip was made to various native settlements in Whale Sound.

On Monday, April 1st, Mr. Peary, with Mr. Lee, Henson, six Eskimo and sixty-three dogs, left Anniversary Lodge for the interior. On the first day they advanced twelve miles beyond the edge of the ice-cap. The following three marches were interrupted by searches for the lost caches, two of which only were found, the poles, which had been left the March of the previous year twelve feet above the snow, only just rising above the surface. After the search was over, the Eskimo turned back, and the travellers continued their journey with three sledges and forty-one dogs, and after five days' march, were brought to a standstill by a violent storm of wind rushing down from the interior to Petermann Fiord. It worked havoc among the harness and traces, and buried the sledges in deep drifts. At the close of the week, the party was only 200 miles from the moraine. The elevation was 7000 feet above sea-level. The following week more satisfactory progress was made, something like 100 miles being covered. The thermometer ranged from $-10°$ to $-25°$ F. at noon, and from $-25°$ to $-43°$ at midnight. At the beginning of the fourth week it became evident that some change must be made. As a number of dogs had given out, the baggage was concentrated on two sledges; and Lee was sent ahead to set the course. With this arrangement, the party succeeded in travelling 122 miles during the week. It was hard work, for some of the time they were nearly 8000 feet above sea-level, and the average for the week was 7700 feet. This great elevation had a marked effect both on dogs and men, especially as their strength being weakened by want of proper food, for frozen meat had to be substituted for the pemmican left in the caches.

After the four-hundredth mile, misfortunes came on thickly. The sledges broke down, and the last walrus meat was served out to the dogs. Soon their number was reduced to eleven, and these were hardly able to walk. Leaving the survivors under the charge of Lee, at an elevation of 5000 feet, and about six miles from the land, Peary and Henson pushed on in search of musk oxen, but as soon as they reached the land snow began to fall, and after staying two days and nights they were obliged to find their way back to the tent. On a second attempt another storm was encountered, but at length a herd of musk oxen was found, and a bull, five cows,

and four calves were killed. The remainder of the herd disappeared at full gallop over the summit of a mountain, and no more of these animals were found again. Then a wearisome journey of four days, up and down steep slopes and through boulder-strewn gorges, brought the party to Independence Bay. Another search was made for musk oxen, but evidently they had taken fright and left the region. Under these circumstances there was nothing to be done but return while the dogs were in fair condition. By this time the snow had melted, and the bumping over the bare rocks quite destroyed the sledge. At the moraine Henson constructed a sledge from a pair of *skier* left there for the purpose, and a forced march of thirty-five miles brought the travellers to a cache. Fortunately the weather was favourable, so that the party succeeded in reaching the Lodge in twenty-five marches, arriving on June 25th. The last provisions were consumed at the beginning of the last march, twenty-one miles from the Lodge. Only one dog returned to the Lodge.

The *Kite* arrived on July 31st, but could not enter Bowdoin Bay on account of the ice. Mr. Peary's party joined her at M'Cormick Bay, and she sailed to Karnah, then to Littleton Island and Cape Sabine and back to Whale Sound. Afterwards she sailed to Wolstenholme Sound and to the Loon mountains in Melville Bay, where the two meteorites, the Woman and the Dog, which for ages furnished the Eskimo with iron for their knives, were dragged over a mile and a half of rock, glacier, and floating ice and safely embarked. The larger weighs about three tons. Before turning homewards the *Kite* visited Jones' Sound and Lancaster Sound, and calling at Disco reached St. John's, Newfoundland, on Sept 21st.

The mapping of Whale Sound, and the studies and ethnological collections of the Arctic highlanders have been completed. Another year's meteorological records have been obtained. The *Kite* has also on board the most valuable collection ever brought from the Arctic regions. It is mainly the work of Professor Dyche of Kansas University, who collected nearly 4000 specimens of birds, eggs, and animals in the neighbourhood of Holsteinburg.

The Weather of the United States in 1894.—The Annual Summary of the U.S. Weather Bureau has lately been issued. Atmospheric pressure is first dealt with, and a chart is given showing the means, reduced to sea-level but not to standard gravity. The method of reduction employed is that of Professor Hazen, of which an explanation is given by Professor Hazen himself. Laplace's formula is the basis of reductions of barometer readings to sea-level, but it has been found that in individual cases serious errors have been introduced, due partly to the fact that the mean of the temperatures at the base and summit of an isolated peak is not the temperature of the air column. A table has been formed for Mount Washington, by arranging each difference of pressure between summit and base according to the mean temperature of base and summit at the same time, and it is found that the error of reduction at zero temperature is $-$ ·36 inches at 22·5 inches, and $-$ ·23 inches at 22 inches. But all high-level stations are not like Mount Washington, with a sea-level station just below. Some are on plateaus, and, in the case of these, approximate tables of reduction were drawn up for the east and west sides of the plateau, and when they corresponded fairly closely were united in a single formula. Baker City, Cheyenne, Denver, El Paso, Santa Fe, and Winnemucca exhibit peculiarities owing to greater or less insolation.

The mean annual pressure in 1894 was greatest over the south Atlantic and eastern Gulf States, the maximum being 30·13, in Georgia. As usual a small area of minimum pressure appears on the chart at the head of the Gulf of California, probably an offshoot of the Pacific low pressure area.

The mean annual temperature was above the normal in New England, the middle and south Atlantic States, and throughout the interior of the country generally, while it was slightly below the normal in Florida and the Gulf States, the plateau and Pacific coast regions. The highest average, as in the preceding year (see vol. x. p. 657), was at Key West, 76·7 ; and the lowest at Moorhead, 30·8. In general, maximum temperatures exceeding 100° occurred from the Mississippi valley westwards to the Rocky Mountains, up to an altitude of 3000 or 4000 feet ; the absolute maximum for the whole country was 113°, at Yuma. The largest annual ranges occurred at Huron, 143° ; Valentine, 141° ; North Dakota, 136° on the average ; Des Moines, 131° ; Pierre, 136° ; Miles City, 133°.

The smallest annual range was 47° at Key West, and at Eureka, San Diego, and San Francisco the range was less than 60°. At most of the meteorological stations there was a progressive accumulation of temperature above the normal, as shown by the monthly averages. In some cases, however, in Key West and the Gulf States, for instance, the accumulation of the early part of the year became a deficit before its close.

The total precipitation was 114 inches at Taboosh Island, while at Yuma it was only 2·95 inches. El Paso, with 4·24, and San Diego, with 4·35, were the next driest stations. On the whole there was a deficit of rainfall, except over the northern plateau and Pacific coast districts.

Roraima.—Mr. J. J. Quelch describes in *Timehri* a recent journey to the summit of this singular mountain. It is well known that the summit is a horizontal stratum of red sandstone, with precipitous sides, and appears from a distance unscalable. On the south-western face, however, a tree-clad ledge runs obliquely from the forest below up to the summit. Towards its upper part the ledge is broken by a wide precipitous gully which from below appears to prevent further progress ; Messrs. Im Thurn & Perkins, however, found it passable in 1885. Many streams fall over the edge of the cliffs, some descending in cascades of 1500 feet in height, and flow away to join the Orinoco, Amazons, or Essequibo.

Below the first forest belt the track was obliterated by tall dense bracken, but in the forest and on the upper slopes it was clearer. It there led over large blocks of sandstone, between which grow grasses and long sedges. Then followed the El Dorado swamp, so termed from its botanical richness. The prevailing tint is given by the exquisite violet-flowered *Utricularia Humboldtii*. A camp was formed at a height of 6400 feet, in the second belt of forest which stretches up to the ledge before mentioned. During the night the thermometer fell to 50° F., and the air felt bitterly cold. Next day Mr. Quelch found the base of the vertical wall to be at a height of 7100 feet above sea-level. The only obstacle in the march up the ledge was a sandstone ridge 9 feet high, which rises suddenly from the path. But this was pretty easily climbed, and soon after the gully through which the Roraiwa-paru descends was entered. Mr. Quelch spent a night on the summit, accompanied by Mr. C. A. Lloyd, while another of the party, Mr. F. V. M'Connell, went down for provisions. The summit has been worn down by sub-aërial denudation into a great number of irregular terraced ridges and peaks, with winding valleys of varying width and depth intersecting the whole surface and carrying the drainage to the edge. Three of the highest ridges rise almost exactly to a height of 8740 feet at their culminating points, and the uniform height of the more massive peaks appears to indicate the former level of the plateau. From the more central peaks the scene is one of absolute desolation, all the blackened rocks and ridges being perfectly bare, but in the lower valleys, some of which are cut down quite 400 feet, the vegetation is comparatively abundant.

Few birds appear to be residents of the summit, and of reptiles and mammals none was met with. Large holes in the sandstone were pronounced by the Indian guides to be tenanted by armadillos, but no specimen was procured. The most interesting creature discovered was a black toad mottled on the throat and belly with bright yellow. This has been named by Dr. G. A. Boulenger *Oreophryne Quelchii*, the new genus Oreophryne being founded for its reception.

Bolivia.—In the *Bol. del Instituto Geogr. Argentino*, Tomo xv. Cuad. 9 and 10, Señor Claudio Osambela describes a journey from Antofagasta to the Beni. He commenced his journey by the railway which was then open to Uyuni, and which he describes as one of the worst in the world. Of the Bolivian highlands and Oruro an account was given in the *Magazine* last year by Mr. Urquhart, and therefore we may pass on to Señor Osambela's experiences after leaving that town. He first visited the port of Oruro, on the Desaguadero, a few hours' journey distant, where he found a numerous party of engineers who had come to study the question of establishing steam traffic along the river from the lake of Titicaca. He then drove on to La Paz, a three days' journey. La Paz is a town of 80,000 inhabitants, and is the richest in Bolivia. The streets are mostly steep and narrow. The heat there is never excessive nor is the winter cold. A ride of three days on mules brought the traveller to Sorata, which is situated in a ravine at a distance of 110 miles from La Paz, beyond the eastern cordillera. It is only a collection of old houses, but solid and convenient. The climate is healthy and pleasant. There is a considerable trade with the Peruvians of the frontier and the department of Puno. From Sorata, still on mules, Señor Osambela continued his journey to Mapiri over *punas*, or high plateaus, where the temperature was below freezing-point, and the snow penetrated into the huts where the nights were passed. From its source near Sorata, the Beni, or rather the Mapiri as it is here called, has a winding course of nearly 200 miles, and is not navigable. Mapiri is a collection of dirty cabins scattered over a hollow a few hundred metres in length, closed in by the high banks of the river, and very unhealthy from want of fresh air and the miasma of putrifying vegetable matter.

We cannot give all the details of Señor Osambela's voyage on rafts down the river and the rapids he had to pass. It is enough to say that from the Puerto Mapiri, the highest navigable point, to the Puerto de Atamarani, in lat. 14° 20′ S., the distance is 143 miles. Below this place the Beni is navigable by steamers throughout its length of more than 430 miles. For the first 180 miles the country is uninhabited and, indeed, uninhabitable, for in time of flood the river covers the land for miles around. Along the remaining 250 miles the banks are occupied by establishments for the collection of indiarubber. As the traveller descends to the lower country he sees nothing but unbroken forest, but in reality the forest is only 30 or 35 miles broad in the valleys of the larger rivers, such as the Beni and Inambari (Upper Madera), and much less along the smaller tributaries of the Amazons basin. Beyond the woods a nearly plain country rises imperceptibly and then slopes down again to the next stream. The cause of the absence of trees is the small depth of vegetable soil and its great hardness, the subsoil being a very compact rock containing carbonate of iron.

The basin of the Alto Madera extends southwards as far as 20° S. lat., and has an area equal to that of France. The country it flows through is rich, especially in indiarubber, and the collection of this article alone has developed extraordinarily in the last few years, and will, in Señor Osambela's opinion, prove in the long-run a more valuable source of wealth than the nitrates of Tarapaca, since the trees reproduce themselves and mineral deposits do not.

Señor Osambela notices a remarkable geographical feature between the Beni and Mamore. Reyes, near the beginning of the Lower Beni at Atamarani, and Exaltacion, on the Mamore (lat. about 12° S.), are in an immense prairie of elevated land with a hard ground scattered over with clumps of trees, but there is no communication between them by land, for a great depression begins about 60 miles north of Reyes, extending from the forests of one river to those of the other, which is always full of water forming the Laguna Rogagua, to the north of Reyes, and the Laguna Rojaguada, south of Exaltacion; between them lies the immense swamp called El Tapado.

As regards communication with these rich valleys of the Amazons basin, Señor Osambela prefers the Ucayali to the Pongo de Manseriche route (see vol. viii. p. 387). The Ucayali is, he affirms, navigable by ocean steamers up to Pacalla, which is nearer to Lima than Manseriche is to Payta. The country down to Lima is inhabited, and a railway has already been made for about half the distance, that is, from Lima to Oroya; and the remaining half would not cost a fifth of what has been spent on the line already open. He also recommends the construction of a narrow-gauge railway from the Upper Madera to Pacalla which would also cross the rivers Purus and Acre. The map which accompanies this long paper contains many new geographical details, and has several latitudes and longitudes marked on it.

AUSTRALIA.

The Seasons in South Queensland.—Mr. Clement C. Wragge, Government Meteorologist of Queensland and Corr. Member of the Society, has forwarded the following communication from Mr. A. W. Bucknell, of the Yarawa station near Munguidi, on the N.S. Wales border:—

"When we first came here, in 1842, the blacks had many stories to tell of a drought that had occurred a few years previously, no doubt that of 1838 and 1839, which I distinctly recollect. I was in Sydney at the time, and remember that flour rose to £100 a ton.

"1843 was a dry year, 1844 wet, and 1845 not too dry. 1846 was dry, and there was a regular drought in 1847. In 1848 very heavy rain, causing floods, fell early in January. 1849 was rather dry, and another drought occurred in 1850, lasting till January 1851. (Gold was discovered this year by my friend E. H. Hargreaves, who came back from California on purpose to search for it in New South Wales.) Good or fair seasons then followed until 1862, when there was nine months' drought, the first rain falling in Queensland in December, here on January 17th, 1863, and at Lachlan on February 14th. In 1864 there were great floods in this district. 1865 was a good year, in 1866 came another drought, and in 1867 the rain came at the end of March. 1868 again was dry, and in 1869 the rain commenced at the end of March. 1870 to 1874 were all very wet years. In the last, Lake George was filled for the first time since 1824; in the forties it was a cattle station. 1875 was a good year, and 1876 wet, high floods occurring on the Clarence and Barwan rivers. 1877 was dry, and in 1878 a drought lasted till about August. 1879 was good, 1880 drier, and 1881 to 1885 were years of scarcity though there was no decided drought. An inch or two of rain fell, and then there was no more for six, eight, or ten weeks, and consequently there was never a proper crop of grass. The losses of stock were very great in 1884, 1885, and up to May 24th of 1886, after which rain fell and floods took place. 1887 was a year of plenty. Another drought set in in March 1888 and continued till March 1889; during these thirteen months only four inches of rain fell here. Great rains and

floods occurred in the years 1890 to 1894. In the present year nine inches fell in January, and there has been none since.

"From the above epitome I can see no periodicity in the seasons. Saxby's predictions proved true several times to my certain knowledge, and I cannot help thinking that he had hit upon a true theory of the weather, as far as it went."

Mr. Wragge remarks that Antarctic influences, of which but little is known, undoubtedly play no small part in determining the character of the Australian seasons. Hitherto he has always refused to issue long-range forecasts, not receiving sufficient data from high latitudes to undertake such great responsibility.

GENERAL.

The Southern Continent.—In the *Geographische Blätter*, Bd. xviii. Heft 3, Prof. Dr. S. Ruge traces the early history of the southern continent, beginning with the Chaldæan Seleucus, who in the second century B.C. declared that the Indian Ocean had no tides. Relying on his authority, the astronomer Hipparchus and the two geographers, Marinus of Tyre and Ptolemy, adopted the notion that the Indian Ocean was surrounded by land, and in Ptolemy's map the southern extremity of Africa is accordingly connected with the Golden Chersonese. In the Middle Ages, when even the knowledge of the Greek language was almost entirely lost, the legend was forgotten, but at the Renaissance in the fifteenth century the Alexandrian scientist became for half a century the instructor of the West. And even when the discoveries of the Spaniards and Portuguese threw doubts on the accuracy of some of Ptolemy's theories, and even after a new world, of which he knew nothing, was discovered, his methods and a great part of his teaching, somewhat modified, indeed, still maintained their sway. When Vasco da Gama sailed from the Atlantic to the Indian Ocean, it was proved that the southern continent did not entirely enclose the latter. Again, in the first decade of the sixteenth century, the Portuguese and Spaniards advanced further and further down the east coast of South America, and tidings of the great southern land were anxiously expected. And such appeared to have been obtained when, in 1514, two Portuguese ships belonging to the great firm of Haro returned with the news of a discovery which was supposed to point to the existence of a southern continent. An agent of the Fuggers of Augsburg forwarded the news, and the report of the voyage was printed by Erhart Öglin under the title *Copia der Newen Zeytung aufs Presillg Landt.* The name of the captain has not been discovered, but Dr. Konrad Haebler has found an early manuscript account of the voyage in the Fugger archives, showing that the date was 1514. Dr. Haebler treats fully of this manuscript and the voyage it describes in the *Zeitschrift der Gesells. für Erdkunde zu Berlin*, Bd. xxx. No. 4. He comes to the conclusion that the channel discovered was the mouth of the Rio de la Plata. Indeed, the ships appear to have proceeded farther south to a land where the natives dressed in furs, and the mountains were covered with snow; but they did not reach the Straits of Magellan. On Johann Schöner's globe of 1515 the continent appears as a huge island off the southern point of South America, which latter is displaced to 40° S. lat. The first foreign cosmographer to adopt Schöner's view was the Frenchman Oronce Finé, who in 1531 marked the southern land with the words *Terra australis recenter inventa sed nondum plene cognita.* His continent, however, extends all across the South Pole, and occupies the southern portion of the Indian Ocean, as in ancient times, and the name of Brazil, which on Schöner's globe stands to the south of America, is moved to the south of Further India. A little later, between 1541 and 1570, the French maps of Desliens, Desceliers, Rotz and G. de Testu showed a huge southern land joining on to Java the Great,

with an outline remotely resembling that of Australia, whence the discovery of the fifth continent has sometimes been claimed for French seafarers.

In the sixteenth, seventeenth, and eighteenth centuries four nations took part in the search for the supposed continent—Spaniards, Dutch, French, and English. The Spaniards were the first on the scene, for it lay in their sphere of influence, in the western hemisphere granted to them by the Pope. Tierra del Fuego was discovered by Magellan in 1520, and the north coast of New Guinea in 1545 by Ortiz de Retes. These two points were joined on maps by a coast-line which ran south-westwards from New Guinea, and, leaving a strait of insignificant breadth to the south of the Cape, crossed the Atlantic to Tierra del Fuego. In 1567 a squadron was sent by the Marquis of Mendoza from Peru, under the command of Mendana, who discovered the Solomon Islands, and, refusing to sail farther to the south-west as his captain Pedro de Sarmiento urged, returned contented with having found, as he supposed, another portion of the southern continent. In 1595 Mendana discovered the Marquesas and the Santa Cruz archipelago, where he died. His pilot, Pedro Fernandez de Quiros, having journeyed to Spain and to Rome, obtained funds to fit out three ships, with which he sailed from Callao in 1605, and the following year discovered Tahiti and the New Hebrides, as they were afterwards named by Cook.

The part that the Spaniards took in settling the question was, therefore, insignificant. Drake did more, for, after passing through the Straits of Magellan in September 1578, he was driven by stormy weather as far south as lat. 56° S., where he anchored off an island he named after Queen Elizabeth, and then returning northwards met with other islands in lat. 55°. The land in this region was in his opinion nothing but a collection of islands. The claim of Dirk Gerritsz, as the name should be spelled, being an abbreviation of Gerritszon, to have discovered the islands now known as the South Shetlands, Professor Ruge fully investigates and rejects. Richard Hawkins and Herrera, the latter referring to one D. Ricardo Aquines, took up the view that Tierra del Fuego was only a group of islands, and this was generally admitted to be correct in the first decade of the seventeenth century, when Jakob le Maire set out in 1615 to search for a new route to the Pacific, and doubled Cape Horn.

Here Professor Ruge leaves the subject, the later voyages, and especially those of Captain Cook, which finally solved the question, being well known and yielding few points for discussion.

The High-level Observatories of the World.—The following list is taken by *Globus*, Bd. lxviii. No. 13, from *Nature*. The first station on a mountain summit was erected by the U.S. Signal Service on Mount Washington, 6278 feet high, in 1870. Perhaps nowhere in the world has such bad weather been experienced as there. In February 1886 a temperature of −58° F., and a wind velocity of 184 miles per hour were recorded. The meteorological station on Pike's Peak, situated at a height of 14,130 feet, was for many years the highest in the world. These have now been abandoned, and the only two high stations in the country where observations are made throughout the year are the Lick Observatory on Mount Hamilton—intended chiefly for astronomical purposes—and the Blue Hill meteorological observatory at a moderate elevation. In 1893 Harvard College erected a station near Arequipa in Peru, on the summit of the volcano El Misti, 19,296 feet high, abandoning an earlier station established on the slopes of Chachani at an elevation of 16,650 feet (see vol. x. p. 209). As no observer can reside at such an altitude, the observations are recorded by self-registering instruments capable of working for two weeks without attention.

France has a whole series of high-level stations—on the Puy de Dôme (4798 feet) in the Auvergne, on the Pic du Midi (9436 feet) in the Pyrenees, on Mont Ventoux (6248 feet) in Provence, and on the Aigonal (5146 feet) in the Cevennes. But they must be considered as incomplete, for they have no twin stations below, and their observations are not published in detail. In 1890 M. Vallot erected several stations on Mont Blanc and its neighbourhood. The highest of these, on the Rochers des Bosses, 14,350 feet high, is equipped with self-registering instruments (see vol. x. p. 429). The observatory of M. Janssen on the summit, 1430 feet higher, was commenced in July, and observations will probably be made in the present year. It will contain self-recording instruments capable of working for three months. Amongst the German and Austrian stations the most important is that of the Sonnblick, a summit of the Austrian Alps 10,200 feet high. Switzerland now possesses one of the best situated and best equipped stations in the world, on the Säntis (8196 feet) in the canton of Appenzell. Italy has lately erected a station on Monte Cimone (7098 feet). The Ben Nevis Observatory need be mentioned here only to complete the list.

The Telegraphs of the World.—The total length of the lines now opened is 1,062,700, of which 380,700 are in Europe, 545,600 in America, 67,400 in Asia, 21,500 in Africa, and 47,500 in Australia. Of individual countries the United States has the greatest length of telegraph line, namely 403,900 miles, and the second in the list, European Russia, has only 81,000. Germany follows close on the heels of Russia, and then come in order France, Austria-Hungary, British East Indies, Mexico, the British Isles, Canada, Italy, Turkey, Argentina, Spain, and lastly Chile, with only 15,900. But if the density be considered, the order is entirely changed. Then Belgium comes first, with 409 miles of telegraph line to every 1000 square miles of country. Germany follows with 350, and is succeeded by Holland. The United Kingdom has 280, and Canada only $10\frac{1}{2}$.—*Deutsche Rundschau*, Jahrg. xviii. Heft 1.

MISCELLANEOUS.

The 400th anniversary of **Cabot's** discovery of **America** on June 24th, 1497, is to be celebrated in Canada in 1897.

The Portuguese transcontinental railway of **Africa** has now been opened to Queta, a distance of 188 miles from St. Paul de Loanda.

The new railway, from St. John's to the west coast, **Newfoundland**, noticed in vol. x. p. 376, has been opened.—*Commerce*, Sept. 18th.

The draining of Lake **Trasimene**, a project discussed so long ago as the time of Napoleon I., is now to be carried out. The circumference of the lake is about 130 miles.

Baron Ferdinand von Mueller proposes that an expedition should be sent to the north-west of Australia to search for the bones of **Leichhardt**, who perished in 1848.

The **railway** from Rockhampton on the east coast of **Queensland** now extends to Long Reach, a distance of 425 miles. It is proposed to prolong it to Point Parker on the Gulf of Carpentaria, 450 miles farther.—*Deutsche Rundschau*, Jahrg. xviii. Heft 12.

After Sept. 13th, 1899, **Sevastopol** will be closed as a commercial port and be reserved exclusively for war vessels. The port of Theodosia will by that time be provided with the necessary constructions for the carrying on of trade.—*The Nautical Magazine*, Oct. 1895.

The American astronomer, Pickering, has determined the height of the mountain **Aconcagua**, in Chile, by triangulation from two different points, each observation having been repeated thrice. The result gives a height of 23,028 feet, or 160 feet greater than the measurement hitherto accepted as the most reliable.—*Deutsche Rundschau*, Jahrg. xvii. Heft 12.

Captain Bottego, famous for his exploration of the river Jub, has returned to East Africa in order to continue his explorations and those of Prince Ruspoli. He intended to land in September at Brava, on the Somali coast, and, after founding a station at Lugh above Bardera, he will try to reach the Omo river and clear up the uncertainty regarding its hydrographic relations.—*Petermanns Mitt.*, Bd. xli. No. 9.

The calculation of the inhabitants of **Venezuela**, made in 1800 at the instigation of Alex. von Humboldt, gave as a result the number 780,000. In the year 1891 a census was taken, and the population was found to be 2,323,527. They are nearly all Catholics. Three-quarters of the people have no education ; 378,397 can read only, and 356,876 can read and write.—*Deutsche Rundschau*, Jahrg. xviii. Heft 1.

It is seriously proposed to make **Berlin** a maritime port. The small Tegel lake, to the west of the city, is suggested as the harbour. The canal would enter the sea at Stettin. There would be no engineering difficulties, the greatest change of level, at Eberswalde, entailing only the construction of two locks to enable vessels to descend to the valley of the Oder. The cost of the whole scheme is estimated at about ten millions sterling.—*Commerce*, Sept. 11th.

Mr. T. D. La Touche of the Indian Geological Survey recently sent a map of **Bhakar on the Indus** to the Asiatic Society of Bengal for exhibition (*Proc.*, April 1895). It was drawn by Akbar's orders, and now belongs to a descendant of the Governor of Rohri in the time of the annexation of Sind by Akbar, 1591-92. The most interesting point in the plan is the building depicted as standing on a rock in the middle of the river. This is probably the refuge referred to by ancient travellers in Sind. Now both rock and refuge have been washed away. Not a single camel is shown on the plan, but there are three elephants, an animal never now seen in Sind, and the distinctive Sindhi hat is conspicuous by its absence.

The *Quarterly Journal of the Polynesian Society* continues to furnish interesting matter of various kinds—ethnological, social, antiquarian, and linguistic, besides more definitely geographical notes on the lesser-known islands. No. 1 of vol. iii. contains a remarkably clear and interesting description by Mr. Moss, the British Resident in the Cook group, of the native polity in the island of Raratonga, showing the strange unwisdom of the legislation introduced under missionary auspices, the consequent curious reaction to heathenism, and the eventual return to a system more consonant with native ideas. Published in New Zealand, the *Journal* naturally gives prominence to questions of Maori history, migrations, customs, and traditions, which are treated with ability and knowledge, sometimes by native (Maori) writers.

NEW BOOKS.

The Land of the Nile Springs: Being chiefly an Account of how we fought Kabarega. By Colonel Sir Henry Colvile, K.C.M.G., C.B., Grenadier Guards. Illustrated by Mr. J. Burrell-Smith and Mr. Twidle, from Sketches by the Author and Major Thruston, and from Photographs by the Author. Two Maps. Pp. xv+312. London: Edward Arnold, 1895. *Price* 16*s*.

This volume is a record of events during the author's entire stay in Uganda, but is chiefly taken up by his campaign against Kabarega, the old rival of our protégé, King Mwanga. The matter was urgent, for on Colonel Colvile's arrival and assumption of the command Kabarega was already on the frontier, and the entire able-bodied population of Uganda turned out on the summons of their chief. But the really valuable part of Colonel Colvile's force was a band of some 400 Sudani veterans, whose discipline and soldierly instincts seem remarkable. The result of the campaign was satisfactory; the skill and judgment of the commander were admirably seconded by his British officers, and a succession of defeats greatly damaged the power and prestige of the enemy.

The narrative is full of interest of various kinds, and very agreeable reading, with an unfailing vein of cheery humour, and the information gained as to the character of the country is of considerable value. The author's theory on the treelessness of Uganda is that the forest has been destroyed by a race of industrious cultivators, who have themselves gradually disappeared. But Usoga to the east, and Unyoro to the north, are not only better timbered but more thickly inhabited and better cultivated. Much land lies unoccupied awaiting cultivation, and the author has no misgivings as to its successful colonisation by European cultivators. Here we think he is sanguine, but he points out that the plains of Bulamwezi and the high lands of Singo (neither of which names, by the way, appears on his map) with an elevation, respectively, of 4000 and 6000 feet, and a dry climate—the moisture from the lake being mostly intercepted by the ranges which separate it from the districts in question—have a different climate from that of the lake borders with which we are chiefly familiar. This he mildly stigmatises as "pleasant, but decidedly relaxing."

His description of the *Sudd*, the masses of papyrus which choke the river, is curious. Looking down from a height, you seem to look on a beautiful wide grassy valley, but below the green surface is the river, flowing so imperceptibly that the traveller, wading through, erroneously pronounces such regions to be "swamps." But the author considers that by the drainage accompanying scientific agriculture, and by cutting passages through these vegetable barriers, many useful waterways may be created.

We note that he considers the great mortality among horses to be mainly due to chills, and to be avoided by sheltering them at night; fever being often traceable to the same cause.

We commend to students of folk-lore two stratagems by which Kabarega tried to hinder the approach of the attacking force, viz., the impalement of a man, and the burial of a ram alive with only the head above ground, in the centre of the pathway.

Canyons of the Colorado. By J. W. Powell, Ph.D., LL.D. Meadville, Pa.: Flood and Vincent, 1895. 4to. Pp. 400.

In this beautiful and instructive book the author gives a popular description of that wonderful region which his own explorations first revealed in all its extent

and infinite variety. These explorations were not undertaken for the sake of adventure, but for purely scientific purposes, and upon his return from his journeys Major Powell had no intention of doing more than record their scientific results. So much general interest, however, was excited by this journey, that he was induced, in 1874, to write a few illustrated articles for *Scribner's Magazine*; and shortly afterwards the daily journal he kept during his wanderings was published in an official report, entitled "Exploration of the Colorado River of the West and its Tributaries." From that work and from Captain Dutton's monograph on the Tertiary history of the Grand Cañon, and other publications issued by the U.S. Government, an adequate knowledge of the geographical aspects and the geological structure and history of the cañon region can be obtained. But something more than this has been asked for again and again, and Major Powell, yielding to the frequently expressed desire of his countrymen, has at last presented them with the present sumptuously printed and beautifully illustrated volume. Here we have the original journal, full of graphic description of the wonderful and weird cañon scenery, and the adventurous and perilous boat journeys, which one cannot read without emotion. The author has revised and enlarged his original account, but this has been most judiciously done, so that the story loses none of its freshness and power. He has also added several new chapters descriptive of the region and of the people who inhabit it. The book is literally crowded with illustrations—some from drawings, others from photographs—and all so aptly chosen and so beautifully executed, that the reader will be dull indeed who does not gather from these pages some adequate conception of the Colorado wonderland.

Das Deutsch-Ostafrikanische Schutzgebiet. Im amtlichen Auftrage von Dr. Karl Peters. Mit 23 Vollbildern und 21 Textabbildungen, sowie 3 Karten in besonderer Mappe. München und Leipzig: R. Oldenbourg, 1895. Pp. 419, Appendix and Index.

Dr. Karl Peters, well known as a German traveller and explorer in East Africa, was requested by the Colonial Department of the German Foreign Office to compile a work detailing as far as possible the condition of German East Africa from a commercial point of view, and the result, as might have been expected from the author, is favourable, although in some ways we think the generalisations are rather too favourable, and, perhaps, written without due consideration. Notwithstanding, we cannot help wishing that we possessed like publications dealing with our spheres of influence in Africa.

We quite agree with the author that the foundation of colonies is due to the commercial necessities of a people, and we see no reason why Germans should not enter into competition with other Powers possessing colonies. All the same, it would be a great mistake in our opinion were the Germans to take too rosy a view of their African possessions at any rate. As was seen at the last International Geographical Congress, the best authorities are far from agreeing as to the possibilities of colonisation in Africa at all, and yet we find that in German East Africa Dr. Peters mentions large areas as fitted for German colonists. The three maps, be it said in passing, are graphic and admirably constructed, whilst the illustrations which adorn the volume, and which are mostly from photographs, are extremely valuable and give a remarkably good idea of the country with which the author deals. We wish the book every success. It is a remarkably good piece of work, and is well calculated to stimulate others in following, not only the exploring, but the literary, talents of the author.

Matabeleland and how we got it. With Notes on the Occupation of Mashunaland, and an Account of the 1893 *Campaign by the British South Africa Co., the adjoining British Territories, and Protectorates.* By Capt. Chas. L. Norris Newman. London: T. Fisher Unwin, 1895. Pp. 243.

Twenty years' residence in all parts of South Africa gives Capt. Newman right to express his views regarding that rich and rising country. The book before us is dated "Bulawayo, Matabeleland, 1894," and discusses the rise and fall of the Matabele nation and the substitution of the *pax Britannica* for the constant bloody feuds of savages. As Special Commissioner for Matabeleland on behalf of Reuter's Agency, Captain Newman was despatched from Capetown in December 1893 to learn the exact truth of how matters stood and were progressing in the North, paying special attention to the rumours of so-called "Atrocities," circulated by the "Little England" party at home. He accordingly took train to Vryburg (774 miles) and proceeded *viâ* Mafeking, Palapye, Tati, and the Mangwe Pass to Bulawayo. There he met, employed officially, certain scions of noble English houses stigmatised by the "Little England" leader as "enervated specimens of a dying aristocracy," which Captain Newman characterises as grossly untrue, for these officials, thus sneered at, could "for hard work, roughing it, and commercial acumen, hold their own with the shrewdest and best trained Colonial men." He found also the so-called "Atrocities" a deliberate falsehood, as the natives themselves told him such incidents had never occurred. Altogether, the book is one which must be very unpleasant reading at the *Truth* office, for it contains, as Captain Newman says in his preface, "the truth, the whole truth, and nothing but the truth." Numerous maps of battles are given throughout, and a sketch map of the Matabele War Area is prefixed.

Among the Gods: Scenes of India, with Legends by the Way. By Augusta Klein. Edinburgh and London: Wm. Blackwood and Sons, 1895. Pp. x+355.

This is an account of the rather uneventful tour of a father, his three daughters, and a maid, to the principal places along the main lines of railway. The family hardly left the beaten track, but interested themselves chiefly in visiting the principal temples on the route: hence the title of the book. The author has in places woven in legendary passages from the Puranas, the Granth, and other sacred books of the East, which give local colour to the descriptions of the temples visited. There is much pleasant information about missions and missionaries. Not the least interesting feature of the volume is the series of twenty-two illustrations from photographs, which are excellent of their kind.

Quaint Korea. By Louise J. Miln. London: Osgood, M'Ilvaine, and Co., 1895. Pp. 306.

A woman's opinion upon Korea is worth having, now that that country has bulked so largely on public attention. Founded upon the notes of a lady who resided several months in Korea, such an opinion is furnished by Mrs. Miln in this volume. Her chapters on "Korean Women" are especially interesting, and readers wishing to understand the "geisha" of Korea, who correspond to the "Yoshiwara women" of Japan and the "flower girls" of China, will have their curiosity satisfied by a perusal of this book. As for the religion of Korea, it consists only of superstition and ancestor-worship. A glossary is given by Mrs. Miln, but neither index nor map.

The Model Republic: A History of the Rise and Progress of the Swiss People. By F. Grenfell Baker. London: H. S. Nichols and Co., 1895. Pp. 550. *Price* 10*s.* 6*d. net.*

Visitors to the "Playground of Europe" seldom study its history, but Mr. Baker proves that this is both interesting and instructive. He shows us, for example, that so far back as the fifth century French and German Switzerland existed, the former corresponding to the portion then belonging to Burgundy, whilst the latter was occupied by the Allemanni. The people of the Canton of Ticino were then, as now, essentially Italian. Thus the geographer learns from history what would otherwise be inexplicable.

Mr. Baker seems unwilling to accept the usual English names for Swiss places, and calls the Lake of Geneva "Lake Léman," Zarich "Zürich," Constance "Constanz," and Basle "Basel." On the same principle he ought to have called Geneva "Genève," as its inhabitants call it. The canton usually written "Schwyz" he terms "Schwyx." Whilst he derives the term "Alps" from *Alb* (white), although green pastures are also known as "Alps," he does not furnish us with the derivation of "Suisse" or "Schweiz" from whence the whole country took its title. In Roman times, the northern and larger portion of Switzerland was called Helvetia with its capital at Aventicum (Avenches), whilst the eastern portion was known as Rhaetia. A map of Switzerland in the time of the Romans, by G. Philip and Son, and a map of modern Switzerland, by W. and A. K. Johnston, illustrate the volume.

We regret to see that our old friend William Tell is styled by Mr. Baker the "mythical hero of a shadowy romance." He demolishes the world-famed legend with a kindly but firm hand, and declares it to be "devoid of historical foundation." Even "the tyrant Gessler" is shown to be a compound of three historical personages who lived respectively in the fourteenth, fifteenth, and sixteenth centuries. These three persons were combined, and the result was named "Gessler." After this we are not surprised when Mr. Baker casts doubts upon the "green plateau of the Rütli" having ever witnessed the patriotic gathering which denounced Austrian rule and originated the Swiss Confederation. The legend of Tell and the apple is supposed to have come from Scandinavia, and to have been brought by the Allemanni into Switzerland, as into other lands.

Mr. Baker brings down his history to 1874, when the Swiss Assembly, after years of agitation, agreed to and established a new Constitution, introducing, *inter alia*, and in certain events, the "Referendum" and "Initiative." By the former is meant the reference of new laws or regulations to the general vote of the citizens for approval or rejection before they can be legally enforced. The Initiative, on the other hand, is the method whereby a certain number of votes can compel the legislative councils to introduce and discuss proposals for a new law or the abolition of an old one. The book is pleasantly written, and supplies a want which has been long felt—that of a good, readable History of Switzerland in English.

The History of the Australasian Colonies from their Foundation to the year 1895. (Cambridge Historical Series.) By Edward Jenks, M.A. With two Coloured Maps. Cambridge: The University Press, 1895. Pp. xvi + 352. *Price* 6*s.*

This book is worthy of the author of the *Government of Victoria*, but it is hardly the work looked for. Our great colonies (and the United States) are so predominantly industrial that we justly expect connected accounts of the economic development, first of each of the Australasian group, and then of the group as a

whole. But we are given neither, although it is the subject of primary importance The treatment, too, of present-day questions hardly affords an index to the drift of Australasian policy, or the magnitude of Australasian interests.

On the purely historical side, however, and especially the administrative, the book is little open to criticism. The narrative is clear, facts are plentiful and well arrayed, and the interest is sustained. Typical of the writer at his best are the pages (141-147) which treat of the rise and character of the control of the mother-country over the colonies. In spite, therefore, of some slight errors, such as a careful revision should have obviated, of the meagreness of the bibliographical appendix which is yet fairly authoritative, and of the partial neglect of an essential portion of the subject, the volume is a welcome and significant addition to the series in which it appears, giving evidence of the increasing range of historical investigation and historical sympathies.

The Ruling Races of Prehistoric Times in India, South-Western Asia, and Southern Europe. By J. F. Hewitt, late Commissioner of Chota Nagpore. Volume II. Westminster: Archibald Constable and Company, Publishers to the India Office, 14 Parliament Street, S.W., 1895. Pp. xxxv + 382.

The first volume of this work was reviewed in the number of this Magazine for December 1894, and the remarks then made are equally applicable to the essays contained in this second and concluding volume. We can only repeat that we are lost in wonder at the display of fertility in guesses, at the ingenuity with which resemblances are detected in the myths of widely-scattered nations, and at the industry with which research has been prosecuted, and the threads supposed to run through and connect the bewildering multitude of facts are kept hold of. But Mr. Hewitt's notion of what constitutes proof differs from ours, and his demonstrations do not lead us to share his convictions so confidently announced. Among the authorities on which the conclusions in the second volume are based, the veracious chronicles in the *Arabian Nights* are not the least important, and none is more fruitful of information supplied. If any one can accept these stories as the reproduction of the scrupulously exact and truthful historical records handed down by the earliest teachers of humanity, who held their office to be a sacred trust for which they were divinely inspired, he may be able to accompany Mr. Hewitt with confidence as he traces the history of human civilisation and progress through its various stages, of which the second, it may be said, began about 21,000 B.C. But to those who cannot swallow this assumption the superstructure will seem no more substantial than a dream. Both volumes, it must be added, are provided with very full and helpful indexes.

British East Africa or Ibea: A History of the Formation and Work of the Imperial British East Africa Company. By P. L. M'Dermott. With Map and Frontispiece. New edition. London: Chapman and Hall, Ltd., 1895. Pp. 454, 18 Appendices and Index.

On page 657 of vol. ix. of our *Magazine* we had occasion to notice the first edition of this book, and we then said that the volume was not literature but of the authoritative blue-book order. We do not alter our opinion. The present volume, which is increased by 72 pages, is the same in character. The history of the British East Africa Company is practically carried on to its conclusion, and the notable efforts of a band of commercial philanthropists to open up East Central Africa is accurately detailed. The book is hardly one for popular perusal, but it

is invaluable to the politician and to any one who wishes to understand the complicated relations between the Chartered Company and the British Government. It is not for us to enter into the political details which practically comprise the bulk of the volume. We may only, perhaps, venture to remark that the correspondence between the Company on the one hand, and the Government on the other, is not very pleasant reading to those who have the honour of the Empire and its colonial extension at heart. We may, however, say that, had it not been for the Company and its action, the present extension of our Protectorate over Uganda and the district between it and the east coast would not have been brought to pass, and we are also of opinion that the Company did good service from a geographical point of view by exploring many unknown regions and by aiding very largely the Government survey for a railway between Mombasa and the Victoria Nyanza. In reading this volume it will be evident to any unbiassed mind that a railway is necessary for the whole distance between the lake and the sea. The idea of constructing an iron road for part of the distance and trusting to bullock waggons for the remainder is obviously absurd, and we fail to see how, with any chance of success, any Power can expect to hold the regions round the great Central African Lakes without the aid of steam. Great Britain professes to be the great anti-slavery Power, but, as we have often had occasion to remark, the numerous expeditions from the east coast to the interior of Africa only stimulate the traffic in slaves instead of diminishing it. If politicians and philanthropists will carefully study this volume we are sure that they will agree with us, and for this reason, if for no other, we are glad that the book has arrived at the second edition.

The Royal Natural History. Edited by Richard Lydekker, B.A., F.R.S., etc., with Preface by P. L. Sclater, M.A., Ph.D., F.R.S., etc. Illustrated with 72 Coloured Plates and 1600 Engravings, by W. Kuhnert, F. Specht, P. J. Smit, G. Mützel, A. T. Elwes, J. Wolf, Gambier Bolton, and many others. Vol. ii. pp. xii + 583; vol. iii. pp. xv + 584. London and New York: Frederick Warne and Co., 1894.

The Royal Natural History continues to fulfil its promises. Excellent Edinburgh printing, a generous wealth of illustrations (many of them with a pleasing freshness), and the scholarly, solid, yet most interesting text, combine to make a really splendid book. We have read many pages here and there, and would express our admiration of the manner in which Mr. Lydekker has sifted chaff from wheat, and has utilised the works of the naturalist-travellers. If the publishers would only venture on twelve volumes instead of six, doing the invertebrates justice for once, it would be the best book of its kind.

A Text-Book of Zoogeography. By Frank E. Beddard, M.A., F.R.S. (*Cambridge Natural Science Manuals, Biological Series.*) Edited by Arthur E. Shipley, M.A. Cambridge: University Press, 1895. Pp. viii + 246. 5 Maps.

With two such excellent books as those of Heilprin and Trouessart readily available, it seemed as if there was hardly room for another manual on the geographical distribution of animals. But Mr. Beddard has justified his task. Not only has he given many fresh illustrations, *e.g.*, in regard to earthworms, on which he is a specialist, but he has contrived to bring the general principles of distribution into greater prominence and clearness than heretofore. He has welded together an immense amount of material, yet his book is nowise congested; and he has been successful in avoiding both the extreme of scepticism, which is irritating in a student's manual, and the other extreme of dogmatism, which is illegitimate in

regard to a subject with so many open questions. Occasionally, however, as in the last chapter, he seems to us to have restrained himself too soon.

A Chapter on Birds. Rare British Visitors. By R. Bowdler Sharpe, LL.D., F.L.S., etc. (Zoological Department, British Museum.) London: Society for Promoting Christian Knowledge, 1895. 8vo. Pp. ix+124. 18 Coloured Plates, by Keulemans. *Price* 3*s.* 6*d.*

Whatever Dr. Bowdler Sharpe undertakes is well done; the result in this case is a very interesting little book, describing some of our rarer bird-visitors. Those depicted *im Wort und Bild* are the bee-eater, the common roller, the red-footed kestrel, the rose-coloured starling, the golden oriole, Holboell's redpoll, the scarlet rose-finch, the two-barred crossbill, the shore-lark, the blue-headed wagtail, the white-headed long-tailed tit, the waxwing, the common tree-warbler, the aquatic warbler, the rock-thrush, the Arctic blue-throat, the black-bellied dipper, the red-breasted fly-catcher. Enhanced by Mr. Keulemans' beautiful pictures, the book will be welcomed by the many who love birds; and even the geographer may find facts to puzzle over here.

Open Air Studies: an Introduction to Geology out of Doors. By Prof. Grenville A. J. Cole, M.R.I.A., F.G.S. London: Chas. Griffin and Co., 1895. Pp. xii+322. *Price* 8*s.* 6*d.*

Books treating of science subjects may conveniently be classified under three categories:—first, those intended for instruction; next, those meant for "cramming" purposes; and, lastly, those specially written for the purpose of interesting (and thereby really educating) the section of the reading public into whose hands they may find their way. In geological literature we have of the first many of really first-rate quality; of the second, perhaps the less said the better; while of the third—that is to say, books on geology intended to arouse an interest in the science—we might cite as examples the works of the late Hugh Miller, and Geikie's *Scenery of Scotland.* Books like these have done more to arouse a lasting interest in geology than any of the systematic treatises that have yet been written.

The author of the book under notice has had the advantage of having acquired considerable experience as a teacher of geology, first at the Royal College of Science, South Kensington—and, later, as Professor of Geology in the corresponding institution in Dublin. Amongst geologists in general he is best known as a petrographer; but even though he is mainly a cabinet geologist, he has evidently made such good use of his holidays at home and abroad, as to write of his subjects in a style that one would hardly look for except from the pen of a man whose work had lain for many years almost entirely in the field.

Like nearly all modern books of this kind, *Open Air Studies* is illustrated by process-blocks taken from photographic views, which in the present case have been taken specially for geological purposes. Some of Prof. Cole's pictures are of especial interest to geologists as being reproductions of photographs taken many years ago by the author's father, who, as is well known, was one of the first to employ the photographic camera with any success in recording views of geological interest. The illustrations and the text combine to make *Open Air Studies* a charming book.

School Geography. By James Clyde, M.A., LL.D. Edinburgh: Oliver and Boyd, 1895. Pp. 551.

When a book reaches its twenty-fifth edition, there is no need for the reviewer to say much about it. Teachers have given their verdict regarding this *Geography*

in the most effective way by their demand for it. The present edition is precisely similar in style and contents to the last preceding, except that figures dealing with population, commerce, etc., have of course been brought up to date, and certain alterations have been necessitated, particularly in Africa, by recent political agreements.

The Geography of the British Isles, Physical, Political, Commercial. By WILLIAM HUGHES, F.R.G.S., and J. FRANCON WILLIAMS, F.R.G.S. London: George Philip and Son, N.D. Pp. 119-224. *Price* 1*s.* 6*d.*

The book before us is simply an excerpt from the same authors' *Advanced Class-Book of Modern Geography*, which was noticed in vol. viii. p. 343, with the addition of a few maps. It is much more handy than the bulkier volume.

Cassell's Gazetteer of Great Britain and Ireland: Being a Complete Topographical Dictionary of the United Kingdom. Ched-Frome. London, Paris, and Melbourne: Cassell and Co., 1895.

As the first volume of this *Gazetteer* was noticed in vol. x. p. 672, and several more have yet to come, we shall not say more of this second volume except that, like the former, it contains, in a very condensed form, all information of general use concerning the towns, villages, etc., mentioned. Edinburgh, besides many other interesting towns and localities, is described in this volume.

Climbing in the British Isles. 2.—*Wales and Ireland.* *Wales* by W. P. HASKETT SMITH, M.A.; *Ireland* by H. C. HART. London: Longmans, Green, and Co., 1895. Pp. viii + 197. *Price* 3*s.* 6*d.*

The second volume is equally complete with the first, which was noticed in vol. x. p. 614. Full information has been collected from contributors who are personally acquainted with the mountains described. In a very useful preliminary chapter the tourist is informed where the best centres are for climbing in each district, and then full details are given of the various ascents, from Anglesea and Penmaenmawr down to Plynlimon, with a few notes on more southern elevations.

The book is illustrated by thirty-one striking sketches by Mr. Ellis Carr and by nine plans. Such a guide must be invaluable to those who seek to recruit their health and spend an enjoyable holiday among the mountains.

Illustrated Europe: Nos. 164 and 166. *The Stanserhorn and the Stanserhorn Railway.* By WOLDEMAR CUBASCH.—*Ospedaletti.* By R. ADLER. Zürich: Art. Institut Orell Füssli. *Price* 6*d. each.*

The former of these pamphlets describes the Stauserhorn, well known to visitors to the Lake of Lucerne, and the railway recently constructed nearly to the summit, 6069 feet above sea-level. Ospedaletti is a health resort near San Remo, of comparatively recent growth. Both pamphlets are illustrated and provided with maps, like others of the series.

Panorama seen from the Observatory on the Summit of Ben Nevis. From Drawings by JAMES E. SHEARER. Stirling: R. S. Shearer and Son.

A very clearly drawn panorama, rendered still more distinct by the use of tints shading off to bluish-grey in the distance. It will be exceedingly useful to visitors to the Ben, and will remind them afterwards of the magnificent view from the ummit.

NEW ATLASES.

GEOLOGIC ATLAS OF THE UNITED STATES. Folios 1 to 6 and 8 to 12.
Presented by the Director of the U.S. Geological Survey.

In 1892 a few preliminary sheets of this Atlas were published, and were noticed in vol. ix. p. 676. The Atlas is now to be issued in properly arranged and numbered parts. The contents are very similar to those of the older folios; the colouring is altered slightly, and there are a few changes in the arrangements of the text, etc. When it is stated that each folio contains four maps on the scale of 1:125,000, besides letterpress, it may be conceived what a stupendous work this Atlas will be. Folio 7 has, we believe, been issued, but is not in the Society's Library.

FORMA URBIS ROMÆ. Consilio et Auctoritate Regiæ Academiæ Lynceorum formam dimensus est et ad modulum 1 : 1000 delineavit Rodulphus Lanciani Romanus. Fasc. 1-3. *Mediolani, apud Ulricum Hoepli*, 1895.

The above magnificent atlas of old Rome, on the scale of 1 : 1000, or more than 63 inches to the mile, shows the position of all the ruins, even the most fragmentary, in the city. It may safely be affirmed that nothing equal to it has ever been produced of the kind. (*Presented by Hugh Rose, Esq.*)

PHILIP'S SYSTEMATIC ATLAS : SCHOOL EDITION. By E. G. Ravenstein, F.R.G.S. *George Philip and Son*, 1895.

This is an abridgment of Mr. Ravenstein's larger atlas published in 1894, and reviewed in the last volume of this magazine. In the school edition eleven of the original maps have been omitted, and, what we regret more, so has the introductory chapter on Projection and Scale. A five and a twenty-five fathom line have been added to the maps of the British Isles, which is a distinct advantage.

PHOTOGRAPHS.

ROUND THE WORLD. From London Bridge to Charing Cross, *via* Yokohama and Chicago. In twelve numbers. *Price 6d. each.*

ROUND THE COAST. An Album of Pictures from Photographs of the Chief Seaside Places in Great Britain and Ireland. Parts 1 to 9. *Price 6d. each.*

ROUND LONDON. Parts 1 to 3. *Price 6d. each.*

FAMOUS VIEWS OF THE WORLD. Sixteen Coloured Soliographs. *Price 1s.*

Photographs, though all attempts at depicting grand scenery must fail, do to some extent show the nature of the country, and are very attractive to those who have visited the scenes, as well as to others. The publications mentioned above contain very interesting collections of views, many of them remarkably clear.

NOTICE TO MEMBERS.

Members are reminded that any photographs of scenery or of objects of geographical or ethnographical interest, which they may be willing to part with, will be gratefully accepted by the Society. The photographs should, if possible, be accompanied by the name and address of the photographer.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ANNIVERSARY ADDRESS.

(Read in Edinburgh, November 5th, 1895.)

A JOURNEY IN WEST AFRICA

AND SOME POINTS OF CONTRAST WITH EAST AFRICA.

By Captain F. D. Lugard, C.B., D.S.O.

Three years ago the Council of the Royal Scottish Geographical Society did me the honour to invite me to read a paper before an Edinburgh audience upon travel and work in East Africa and Uganda, from which country I had then recently returned. Upon that occasion the Society further honoured me by presenting me with a diploma, and electing me an Honorary Fellow—an honour which I value very greatly indeed. Now once more I have been invited to read a paper before you, and I feel that I am here to-night, not as a stranger among strangers, as before, but rather as a Fellow of the Society who has been invited to give an account of his Fellowship, and to show, if possible, that your selection was not misplaced. I heartily wish that there was the remotest possibility of my proving this. I wish that I was here to give an account of three years' more work in East Africa, or, better still, that I was still in harness there instead of in Great Britain,—that I was dealing in actions and not in words. This much, at least, will appear from what I have said, that it has not been due to lack of will and of energy that I have no account to give you of my stewardship in East Africa.

It will be, doubtless, within your memory, that at the time of my last visit to Edinburgh it was generally understood that the fiat had

gone forth for the abandonment of Uganda. It was my desire, and my duty, to endeavour, by such means as lay in my power, to awaken an interest in the fate of that country, to point out what had been done amidst many difficulties, what pledges had been given, and of what value this possession might become to the British Empire. But I found little need in Scotland to plead the cause I had at heart. I found a great enthusiasm, and a singularly unanimous verdict in favour of carrying out our pledges, and of not stultifying ourselves in the eyes of Europe by abandoning to anarchy and bloodshed a country for which we had made ourselves responsible by international treaties. I am glad that the opportunity has come to me to-night to tell you the impressions I received from my visits to Edinburgh, Glasgow, Aberdeen, and Dundee in 1892. I thought there was beyond doubt a very strong feeling throughout Great Britain in favour of the retention of Uganda. I think that feeling was nowhere more strongly exhibited than in Scotland, and I believe that it was Scotland which gave the crowning impulse which determined the Government of the day to reverse their intention and maintain the British flag in those parts.

Three years have passed during which I have been but a spectator in the events which have succeeded each other in East Africa, but though I have not been permitted to play an active part in those events, I may plead that I have not been idle, and that it has been my ceaseless endeavour during these years to spread information about the country, either by writing or by less obtrusive methods, with a view to promoting what I consider to be the interests of the country. I claim to have helped, in some small degree, to foster that intelligent interest which has grown up about East Africa, as shown by the extremely well-informed debates in the House, and the general accuracy of the press. Much has been effected in East Africa during these three years. Uganda was first declared a British Protectorate, and Mr. Berkeley was appointed to its command. Later, when the I. B. E. A. Company had been induced to retire and to surrender their charter and all their concessions and rights for a certain money-payment, the whole of the vast territory from the coast to the further side of the lake was included in a new protectorate distinct from Uganda. The charge of this was given by the late Government to Mr. Hardinge, the Consul-General and Diplomatic Agent at Zanzibar. I confess I have misgivings as to the advisability of placing so vast a country under the control of a man resident in an island 150 miles even from Mombasa. The decision to construct a railway from the coast to the lake was the next step taken, and on all grounds it is a pity that it was not taken three years ago; the preliminaries, however, are now going forward, and many of the officials have been appointed.

There is no doubt that this railway will develop the country very rapidly, and that the great areas of fertile and well-watered lands which at present are without any population will offer great opportunities for the energy and industry of Scotch and English settlers. The elevation of these plateaux, varying from 5000 to 10,000 feet, gives them a delightful climate, and the rainfall is abundant. Sir G. Portal asserted

that they were fitted for European colonisation, and Sir H. Colvile goes further, and describes them as "an earthly paradise." Sir John Kirk, at the Geographical Congress, indorsed the view that these uplands would prove suitable for the habitation of the white races. For my own part, I think it premature to discuss the question of colonisation proper. It is enough at present, and for some years to come, to know that they are in every way suited for development by British settlers, who can live there in health and comparative comfort, and who will not improbably be able to make a very profitable livelihood by the cultivation of coffee, cotton, rubber, fibre, cocoa, and many other economic products. The one thing needful is a means of access to these countries, and a cheap form of transport for exporting produce to the coast. The railway will supply this, and on the necessity for its construction, and the advantages likely to accrue from it, both the late Government and the present are in accord.

But I will not speak longer of East Africa and its future, for I have been asked to read the opening paper at the Royal Colonial Institute on Monday next, and it is on this subject that I propose to speak on that occasion. I was led into this short digression upon East Africa—the country, I confess, where my interests centre—by the reflection that it was on my return from there that you honoured me by conferring upon me the diploma of your Society. That diploma, I am proud to say, was given to me not for mere travel, but "for work in Uganda as an explorer and pioneer of civilisation," and I am anxious to show that, in so far as it lay in my power to promote the interests of that country, I have not been idle during the last three years.

Finding, however, last year, that there was no opportunity of my return to East Africa, and satisfied that matters were progressing towards a satisfactory solution as regards that country, I thought that it was time I was doing some active work again in Africa while yet my constitution was strong and my energy unimpaired. The Council of the Royal Niger Company at that time had it in contemplation to despatch an expedition to a country as yet unexplored, to establish British rights and conclude treaties, and they offered me the command of the expedition. I started at the end of July 1894. The position was as follows :—

Territorial claims of the British and the French in the regions of the Upper Niger had been conflicting. After much trouble and friction an international treaty was at length (in August 1890) concluded, by which Great Britain waived all claim to the vast area north of a line drawn from Say to Barua on Lake Chad, with the proviso that the line should be deflected north so as to include under British influence any territories which might rightly belong to the Sokoto Empire; and there are some large areas still claimed by Great Britain under this clause, lying north of the Say-Barua line. North of this line (with this exception) we recognised as French what they were pleased to call the *Hinterland* of their Mediterranean possessions, though the total distance from the Mediterranean to this boundary-line is some 1500 miles. A line of demarcation drawn due east and west, and separating such vast territories

has no meaning unless it be that the meridians running through its extreme points form the east and west boundaries throughout their whole length, unless especially otherwise stated. This was clearly recognised by the French press at the time of the conclusion of the treaty. Sir George Goldie, the Governor of the Niger Company, in his address at the annual meeting of the Company in July last, quoted various extracts from leading French papers on the subject. "We have had recognised to us," says the *Journal des Débats*, "all the Upper Niger and the great bend of the river down to Say. To the south of this point, and *of the parallel which passes through it*, are territories which appear relatively rich and populous. They will not be ours." The *République Française* specially mentions that Borgu will remain in the British territory. The *Siècle* says, "All the territories to the north of that line (viz., the Say-Barua line) are French. The territories directly to the south of that line are left out of French influence." The *Temps*, four months after the 1890 agreement, published a map in which it marked as admittedly British everything to the east of the meridian of Say. The fact that the Niger enters the territories assigned by this treaty to Great Britain, and runs for some distance in a south-easterly direction, has nothing in the world to do with the treaty, in which no mention of the river was made, still less of any limitation of British rights to the territory on the left bank only. There was, indeed, a tacit understanding regarding the river, which consisted in the recognition by Great Britain of French rights over the whole of the Upper Niger, from its source to Say, a distance of some 1500 miles, while British rights were similarly exclusively recognised from that point to its outlet at the sea. This recognition, indeed, involved the abandonment by the Royal Niger Company of claims founded upon treaties extending some 500 miles above Say.

Such was the written and unwritten understanding arrived at so long ago as August 1890. The Niger Company had long before brought the whole of the Lower Niger, up to the rapids below Say, within the jurisdiction of Great Britain. It had also concluded, at the commencement of 1890, a treaty with the King of Boussa, who exercised authority along the riverain districts of Borgu, and, it was understood, claimed also to be paramount chief of the whole of that country. Some time subsequent to this the French undertook a war against Dahomey, in which country they had hitherto exercised no political rights, and the eastern boundary of their new possession became the subject of a separate treaty. This eastern boundary coincided roughly with the meridian of Say, as determined by Colonel Monteil. The French west coast settlement of Senegal was about a thousand miles distant from Say, and it appeared as if all possibility of friction with France had been wholly removed.

The country at Borgu, lying in the north-western portion of the British territory, is one of the very few countries of Africa which had never been explored by Europeans. Various travellers had crossed the extreme portions of the country in the east and west, but none had lived to return to report upon its central areas.

I have said that the Niger Company had long ago made a treaty with Boussa in the eastern portion of this country near to the Niger.

The French advance from the west had, however, been so rapid, that, towards the beginning of 1894, they began to cast jealous eyes on Borgu, and to discuss openly the possibility of annexing it to the French Sudan. The plain meaning of the line of delimitation was utterly ignored. It was contended that the Company's treaties with the Borgu chief Boussa were not valid over the whole of the country, and finally it was roundly asserted that the real king resided at Nikki, said to be the capital of Borgu, and that whoever should first obtain a treaty from him would be the real suzerain over the country. The Niger Company did not for a moment, of course, admit such a statement. They recognised, however, that if the French obtained a treaty with Nikki, it would be made a basis on which to found arguments, however untenable, and that the fact of the French being the first Europeans admitted to that town would be adverse to British interests. Of course the French press had not promulgated this theory that priority of arrival at Nikki would secure all Borgu to the nation whose representative should succeed, before their own expedition was wellnigh ready to start. Then, being assured that there would be no starter on the British side, they announced in the *Politique Coloniale*, that it was "a veritable steeplechase," and they included Germany in the race. For a small portion of Borgu formed a part of the *Hinterland* of German Togoland, as well as of French Dahomey and British Yoruba.

Captain Decoeur suddenly left Marseilles about July 24th. The preparation of his expedition had been kept a profound secret, and the announcement of his departure was the very first news received in England, even by those whose business it was to be acquainted with French plans in West Africa. His destination was Dahomey, and it was said that the objects of his expedition were solely concerned with that country. But British interests were represented by Sir George Goldie, one of the shrewdest and most far-seeing men it has been my fortune to meet. If the French expected to catch him napping and to confront him with their favourite *fait accompli*, they had failed to benefit by their past experience in these regions. On the Niger,—whatever may have been the case on the Nile,—a policy of *laissez-faire* does *not* prevail. On July 28th I left London, telegraphic instructions having already been sent forward to enlist the necessary men for my expedition. Decoeur had the advantages of a few days' start, and a very much quicker and more direct sea voyage, which would increase his start considerably, and a much shorter land journey. I had the advantage of knowing the urgency for haste, whereas he, I believe, was ignorant of my expedition. It was not till August 30th that we reached the mouth of the Niger at Akassa, bringing with us all the necessary paraphernalia of the expedition. By September the 9th we were at Jebba, the limit of navigation of the Niger, about 530 miles from Akassa, and the point from which the expedition was to start on its march. Up to this place we had come by river steamers, having picked up a large number of porters on our way, and forty Hausa soldiers as escort to the expedition, together with many additional supplies, etc., which I was to obtain on the spot. That 530 miles could be accomplished in ten days, in addition to this other work, speaks more

eloquently for the organisation and system of the Niger Company than any long-winded laudation that I could give.

The leader of an African expedition counts it as a condition inherent in his task that he shall continually have to meet and overcome some obstacle, often, of course, trivial, but sometimes serious. Expeditions in Africa, especially those organised against time and in great haste, do not run like a locomotive on a railway track, and no amount of either foresight or experience can avert inevitable difficulties. My first difficulty was regarding the donkeys on which we had mainly intended to rely for the transport of the barter goods, presents, ammunition, and all tent and caravan gear of the expedition, for no animals were forthcoming. Local disturbances at Kano had closed the market, and the deluges of rain—for this was the season of the rains—had incapacitated most of those which had been purchased, and they were dying off daily. Instead of one hundred strong asses I had but thirty-four miserable and sick beasts. This necessitated the enlistment of 150 more porters, since a donkey carries two porters' loads. Another local difficulty militated against the enlistment of these. Some of the loads, also, packed in London, had been carelessly made far too heavy (in spite of instructions) by the firms who had prepared them; and so on. I, therefore, spent a day in Jebba ascertaining all that had to be done, the exact number of porters still required, the few small deficiencies and various details which had been overlooked, and then, leaving the task of supplying these needs in the capable hands of Mr. Lister, an agent of the Company, and my two fellow-travellers, Messrs. Mottram and Reynolds, I started off with Mr. Watts, the Niger Company's political and commercial agent in the northern part of their territories, to see the Borgu chief Boussa, who lived a hundred miles up the river beyond the cataracts. We marched overland and reached Boussa in five or six days. Here a long and exasperating delay took place before I finally got the guides and messengers to conduct me into Borgu. We returned by canoe, shooting the rapids, and enjoying the magnificent scenery, except when deluges of rain made life in a canoe uncomfortable. Marching or canoeing both equally afford of course a good deal of discomfort in tropical rains, and Mr. Watts, though acclimatised by many years of residence and a tough ex-sailor, succumbed to fever. We got back to Jebba to find everything on the point of completion, and on September 27th we crossed the Niger and started on our march into Borgu, having after all lost but little time so far, for we had reached Jebba, 530 miles from the sea, engaged our men, replaced our donkeys, readjusted our loads, accomplished 200 miles to Boussa and back and secured our guides, in twenty-eight days. The credit of this rapid organisation is, of course, in no way due to myself, but to the Company and their energetic agents on the spot, who threw themselves into the work with as much energy as though they were themselves about to undertake the expedition.

Now again we found a fresh cause of delay, for we had to make a long detour through the north of Yoruba before we could enter Borgu by the circuitous and unnecessarily long route which the guides had selected. However, once we were committed in ignorance to this route,

there was no option but to continue on it, for no other path except the narrow track we followed led through the six-foot grass and jungle which extended on every side interminably. The swollen streams and constant rain tried man and beast severely. The labour of unsaddling and unloading each animal at every small brook, now a rushing torrent, and of carrying across the loads and re-saddling on the farther side, was very onerous, and it frequently took from before sunrise to sunset to accomplish an ordinary four or five hours' march. We made a treaty with Kishi, the frontier town of Yoruba in this direction, and then passing through a belt of uninhabited forest and jungle we reached Kiama, the first Borgu chief.

As I have already told elsewhere the story of our experiences in Borgu, I will not inflict upon you a detailed repetition of them. We succeeded in reaching Nikki, and concluded a treaty with the king, leaving the place, after a week's sojourn, some four or five days before Decoeur's expedition entered it from the other direction. All the chiefs and headmen of villages received us cordially and presented us, according to their standing and wealth, with gifts of native grain, yams, fowls, sheep, or even an ox or horse, for which we gave the usual return present in cloth. In fact, this present-giving was carried to such an extent that it became a nuisance and a serious encroachment on our time. Every individual having the remotest claim to position in the village—or even, it would seem, to ordinary respectability—would bring some small offering, generally half a dozen yams, or a scarecrow chicken, and would expect in return a few minutes (or a good many minutes) conversation, and an acknowledgment in cloth. Life in Borgu, however, in spite of all this hospitality and courtesy from the respectable portion of each village community, was by no means free from anxieties and disquieting forebodings. For it would appear that the respectable members of a Borgu village form but a minority of the community. The national characteristic is a love of freebooting and plunder. The Baribas, as the people of the country are called, have earned a reputation in all the surrounding countries as robbers and thieves, and, by their ambushes and night attacks, their deadly poisoned arrows, and their constant forays, have implanted among all their neighbours a dread of their name and prowess, which has become a proverb in this part of West Africa. They must possess, or did at one time, courage and ability in war, for they alone have successfully defied the great wave of Mohammedan conquest which has subjugated the countries on every side of them.

We were not destined to leave the country without an experience of this little weakness of the Baribas for plunder. A band of marauders attacked us, though the local chief did his utmost to dissuade them, and proved his friendship by sending me a midnight warning. The would-be plunderers, however, chose their time and place badly, and my forty Hausa recruits let off their Sniders with such rapidity that the Baribas were struck with dismay and decamped, losing, I believe, amid the hail of chance and unaimed bullets a good many of their leading blackguards. They did us little harm; a porter who in panic crowded too close on the firing line got a poisoned arrow in his chest, and I got one in my

head. The porter was long *hors de combat*, but up to the time of the return of the expedition he had not died, while I myself, thanks either to the numerous filthy things I ate under the name of antidotes, or to an exceptionally wooden head, did not suffer at all from my wound. Day by day after this I received news of intended night attacks, of ambushes, and of great gatherings of all the robbers of Borgu, who would constitute, I should imagine, the greater part of the population of the country. My unarmed mass of 300 odd porters, etc., became quite panic-stricken, and the worry and anxiety began to tell upon myself. We were not sorry, therefore, when we were at length out of the country, and I made up my mind that if ever I visited Borgu again it should be with a force sufficient to teach these covetous rascals a lesson they would not soon forget, if they had not mended their manners meantime. It must, however, be borne in mind that the constituted authorities of the country welcomed us with an apparently genuine pleasure. At each place I heard the same story, that the younger men would listen to no authority, and that by their plundering or raiding they had closed the country to trade, and made it unsafe to travellers—a result which the more sensible deplored, and which they hoped that the advent of Europeans might check.

After leaving Borgu we entered the northern part of Yoruba. This district is separated from the densely populated district which forms the Lagos Protectorate by a long stretch of jungle, in which are no villages or inhabitants. This tract of bush is infested by large and very powerful bands of Borgu marauders, who live by plundering the traders who pass from South to North Yoruba, so that it is not considered safe for a party to cross this uninhabited belt without a very strong armed escort. The Yoruba king of Saki showed us a most effusive hospitality. The highest chief of the town was told off to supply our every need, and to report our wishes to the king, nor were we allowed to depart without an escort for our safety. A great mob of musketeers accompanied us, comprising, in fact, almost the entire fighting strength of the country, under their chiefs. The king was the more nervous for our safety seeing that the caravan of a European coming from the south had not long before been plundered and dispersed. The leader, a Frenchman named Hess, had been wounded by a poisoned Borgu arrow, and had died. It was of primary importance that there should arise no doubt whatever as to British rights over this northern portion of Yoruba, for it lies immediately between the northern limits of French Dahomey and the Niger. I therefore concluded a treaty with Saki, as I had done with Kishi. Travelling southwards along the northern part of the Lagos Protectorate, we passed through the large towns of Iseyhin and Oyo and arrived at Ikirun. Here I found Captain Bower, a District Commissioner of the Lagos Government. There was at the moment a difficulty between him and the Emir of Ilorin regarding the Ilorin-Ibadan frontier. Ilorin is a Mohammedan province owning allegiance to Sokoto, and hence in treaty with the Royal Niger Company. Ibadan, as an integral part of the Pagan Yoruba Confederation, had been included under the Lagos Government. I suggested, therefore, to Captain Bower that we should together survey and suggest a boundary line along the

whole southern frontier of Ilorin, pointing out that as he was in the employ of the Lagos Government, and I of the Niger Company, our joint recommendations would probably carry weight. Having dismissed a great part of my men who had been recruited from the Ilorin district for whom I had no longer any use, Bower and I carried out our task and separated when it was completed by our arrival on the borders of Nupé. Then, marching north, I reached Jebba on January 12th of this year, and disbanded the remainder of my expedition.

Throughout this expedition my two comrades Messrs. Mottram and Reynolds were indefatigable. Upon them fell the main onus of the heart-breaking work with the donkeys, and all the difficulties at the rear of the caravan. But they were always cheery, and always ready to do all, and more than all in their power, and to them is due whatever success the expedition achieved. I need hardly add that no disagreeable formality of orders, and so on, were ever necessary between us. We worked as comrades for a common end until the health of both broke down, and I had to play the part of doctor and nurse in addition to my other duties! But even then they wished to be up and doing, and their only grumblings were against the fate which deprived them of their energy. For such loyal companions the leader of a caravan in Africa cannot be too grateful; nor is it possible to exaggerate how much he owes to such loyalty and energy.

The country of Borgu is not a very interesting one to travel in, for it is flat and presents no features of especial geographical interest. There are no ranges of mountains, no lakes, and no large rivers. The drainage of the greater part of the country is towards the valley of the Niger, while the extreme west and south-west are drained apparently by rivers running into the Volta and other streams which discharge their waters into the sea on the Dahomey or Togoland coast. The greater part of the country is covered with low tree jungle and high grass. In the valleys of the streams this jungle becomes denser, and the trees are of larger and finer growth, mingled in the south with the Oil-, the Borassus- and the Raphia-palms. In the season of drought, when the tall grass is burnt and the trees have shed their leaves, the traveller can obtain a more extensive view of the country through which he is passing, but in the rainy season the track he follows usually lies between two walls of impenetrable grass, or amid thick bush, whose foliage shuts out all that lies behind. Our journey took place entirely in the rainy season, and as there is in Borgu very little rising ground, it was only on the rarest occasions that we could get anything approaching a view of the country. This condition of things adds, of course, greatly to the difficulty of making a dead-reckoning route-map, and as no points on which to take check bearings are visible, one's entire time and attention are engrossed throughout the march in calculating distance and direction. I, however, persevered in making a dead-reckoning chart on the scale of four miles to one inch, as I have done wherever I have been in Africa. This was made quite independently of the astronomical observations taken at various points by Mr. Mottram, and I am very proud to say that when, I closed on my starting-point at Jebba, I found myself not more than 9½

miles out in a circuit of some 750 miles, viz., about one per cent., where I had expected an error of at least 25 per cent.

It will, perhaps, be of interest to the Scottish Geographical Society if I make a few remarks upon route-surveying in Africa. Where the primary object of an expedition is geographical, and the traveller is able to delegate to others all the endless details of caravan work, when his duties are those of a surveyor, and he is not harassed by the responsibility which devolves upon a leader who is uncertain whether at any moment his caravan may not be attacked from an ambush, the question of methods of surveying is a simple one and needs no comment here. But when the leader of a caravan himself does the survey work the case is different. His place is at the head of the long line of men; he cannot stop continually to take bearings, for that means that every tired porter is kept standing with a seventy-pound load on his head. If the country is dangerous, he cannot detach himself from his men by going far ahead of them. Under these circumstances anything like an accurate survey in dense jungle becomes very difficult. In Borgu, indeed, I often thought that it would be almost as easy to survey in the darkness of night, for daylight revealed nothing but impenetrable bush on either side, and one could not see more than a yard or two to front or rear.

Years ago, under these circumstances, I tried to approximate to my direction by incessantly consulting a pocket compass, or by watching the sun shadow of the man immediately in front of me, but it is obvious that the result was of the very vaguest possible. Experience, however, had taught me two great central facts. The first was, that except among fields and cultivated ground, or between neighbouring villages, the track made by the savage who wished to get from one distant point to another was tolerably direct. Making a fixed allowance for the little twists and turns due to the avoidance of petty obstacles, which may perhaps have long ceased to exist, it is tolerably safe to assume that the direction (when traversing uninhabited areas especially) is uniform, and subject only to deflections due to the necessity of crossing rivers or mountains, at fords or passes, etc. Consequently, supposing that it were possible to know the general bearing on which one had been marching for, say, a mile and a half or two miles, and the rate of progress, a fixed allowance per mile for the vagaries of a native path (so well described by Professor Drummond) would produce an extremely accurate estimate of the actual point to point distance as shown on a map. Secondly, as regards the all-important question as to how to determine the true bearing on which one has been marching since the last bearing was taken. I have said that a pocket compass is a poor guide on which to form this estimate. A native path is hardly straight for a dozen consecutive yards; one moment the traveller, whose general direction is (we will say) due west, is walking three paces due south to avoid a fallen tree, at the next he is going due north to recover his direction, and so on. Consequently, the needle of the compass is flying round in every direction, nor is it easy to steady it while walking. An observation of the sun-shadow is a much easier guide, but a gradual

allowance must be made for the course of the sun, while often in a close country there is no shadow to observe.

The only solution, then, you will say, lies in taking prismatic-compass observations some ten to thirty times a minute, or by selecting points for cross bearings. Both these, as I have shown, were under the circumstances not feasible, and it occurred to me many years ago under similar circumstances to utilise that well-known faculty possessed by most natives (and which many call an instinct), which enables them to indicate the direction from which they have come. My own love of big-game shooting whenever time and opportunity for its indulgence presented itself, together with my own complete lack of this faculty, first led me to observe it in my native companions, and to test its reliability. Over and over again after an exciting chase, when we had followed the trail of a wounded animal through dense bush or over low hills, now in one direction now in another, now turning back towards the point from which we had started, our minds engrossed with the excitement and, possibly, the danger of the moment, I have been at a complete loss when the chase was ended, ignorant whether our starting-point was before or behind me, to the right or to the left, and equally uncertain whether it was many miles or less than a mile distant. Though most of the natives with me would have a very tolerable idea both of its distance and direction, I noticed that there was always some one individual who spoke with authority and to whom the others deferred. Selecting one or two such men I tested them continually, and ultimately fixed on one whose instinct of direction appeared unerring. Him I would retain beside me to carry my prismatic, my road-book, haversack, and small rifle, and his business it was to note in his mind the spot at which I took a back bearing, and to indicate its direction when I wished to take the next. Glad to escape from more difficult duties, he would devote himself to this one task, and by constant practice all day and every day I believe that the directions indicated by him became as true as though no dense bush intervened to shut out the actual spot from his sight. This was my custom throughout over two thousand miles of route surveying in East Africa, and throughout my march in West Africa. I was myself solely responsible for calculation of *distance*, my native henchman was responsible for *direction*, and my backward bearings would be taken, according to the nature of the country, sometimes at intervals of a mile, sometimes extended even to three or four miles. This system rendered it possible for me to write fairly copious notes on the character of the country, the soil and vegetation, and to keep up a ceaseless process of mental calculation of distance, and withal not to check and delay the caravan, and to attend to such other matters as devolved upon me over and above the subject of map-making.

From this candid account you will see that only a share—and that the lesser—is due to myself of any credit which may have been earned by the route-maps I have brought back from Africa.[1] The result has

[1] *q.v.*

been successful, for Mr. Coles, who for a score of years, I believe, has been map-curator of the Royal Geographical Society, told me that with perhaps one exception—that of Professor Gill—my route-maps were the most accurate that had ever passed through his hands. Mr. Ravenstein, who has handled more original maps of African travellers than perhaps any other man, speaks in a similar sense, and travellers who have followed me have told me much the same, while the actual result, as seen by the almost infinitesimal discrepancy when closing a circuit on the starting-point,—both in East and West Africa—bears witness to the same thing. Candour has to-night compelled me to disgorge this ill-gotten praise, and to tell you that more than half of it is due to the instinct of the African, and his marvellous "bump of locality." I may add that I found this instinct vastly more universal and reliable in East Africa than in West, and that on my last journey it was long before I could discover a single man who had the vaguest trace of it, until I fortunately found a hunter (enlisted as a donkey-driver) who possessed it in a high degree. I have, I fear, digressed at great length on this subject, but I have done so in the belief that it is a matter worthy of consideration by any society interested in the geographical and cartographical results obtained by travel.

On my return I heard for the first time of the doings of the French expeditions. Captain Decoeur, it appears, had, on reaching Nikki, made a treaty with the king, though of course aware of my prior arrival and of my treaty. In doing so one presumes that he wished to be in possession of an instrument which could be used in case my treaty, when it reached England, should be found to be in any way faultily executed. It is, however, quite correct. In the meantime two officers of the expedition, passing down the Niger after I had left West Africa, told Lieutenant Turner that there was no doubt that I was first and had succeeded in my treaty. Captain Decoeur's treaty made no mention at all of any other. There was no denial or repudiation of the prior one, and no statement of any sort casting any doubt whatever upon it. A month or two later, however, when, presumably, Captain Decoeur's despatches had reached Dahomey, the Administrator, M. Alby, hurried to Nikki and obtained from an individual, whom he declared to be the king, a repudiation of the British treaty, which was stated to have been made by Mohammedan intrigue, without his knowledge and in the name of a king long ago dead. It may seem surprising to you that a chief who had made a solemn contract with me should a few days later be willing to enter with the French into another incompatible with the first, and even more strange that he should, on the motion of M. Alby, repudiate the first entirely. But it must be remembered that the French expeditions were very powerful indeed. I heard (I do not know whether rightly) that Decoeur had five hundred Senegalese regulars, well trained and very brave troops. Already they had had, I understand, one or two fights in Western Borgu, and Nikki was unprepared to resist their demands, though these encounters would naturally make it all the less likely that Nikki would have signed the French treaty willingly. A still further proof of the conditions under which these documents were

obtained—if proof be needed over and above the self-evident facts of the case—was afforded by their methods at Kiama. They had passed from Nikki to visit this chief, and they presumably desired to obtain similar documents from him. Kiama, however, was a man of very much stronger character than Nikki, and he and I had become great personal friends. Moreover, his territories were close to the Niger and to the British there, and he therefore had more confidence in obtaining support. He wrote to me as follows, and the letter followed me to England :—

"From the King of Kiama to his friend, his good friend, to his brother, to the man whom God sent to him, to the one who gave him presents and advice, salutations and greeting.

"After salutation. Indeed I have seen your messenger with your letter, and I have accepted all you have said to me. Truly the Frenchmen came to me three times after your visit. They entered my country suddenly, and they came from the Yoruba country, and they came into this country as if it were a heathen country. I told them to leave and they refused ; and I told them a second time, and they still refused, and they left me in anger. They went and camped beyond the walls together with their loads, and the Yorubas from Kisi ; and the Yorubas refused to carry their loads, as they had not been treated well. After that they left there and came to Bajibo, and they said they were going to make canoes at the water-side. When they reached Bajibo they built two houses. This was told me by my people who bring salt from the water-side. Though I heard this, it was not done with my consent. I did not agree to it. I do not know what country they come from, or what people they are. They are too strong for me, and I pray that you will come between me and them. This is what I want to say to you. I send you one sheep as a present. This is all. Salutations."

This letter, written in Hausa by the people themselves, appears to me to throw much light on the French methods in Borgu. There were in all some four or five different French expeditions, it appears, in the country, commanded respectively by Captain Decoeur, Lieutenant Baud (though these two probably originally started as one), Captain Toutée, M. Ballot, and M. Alby. Of their subsequent actions at Boussa and Bajibo it is not for me to speak here. From what I have already said, you will, I think, agree with me that the British rights to Borgu are without a flaw, and that, setting aside the larger considerations, the French have been beaten even on the grounds they themselves put forward when they lost what they called the "Race to Borgu."

A German expedition under Dr. Gruner also started in the race; and a German colonial organ publishes an account of the expedition, with a map which shows all Borgu as German territory, with the exception of a small strip along the north of Yoruba, connecting Dahomey with the Niger, which they allow to France ! British claims, which alone are really valid, are ignored by the "colonial parties" in both countries. I trust the day has not yet arrived when we shall consent to submit to the national humiliation of being simply ousted from what is justly ours, whether the thing in dispute is of little value or otherwise; but in the state in which matters now are in Europe, only the Power which has force at its back can command respect, and avoid

humiliation, however pacific its intentions, and all these difficulties therefore resolve themselves into the one single and overpowering necessity for strengthening our navy.

I began my paper this evening by recalling some matters connected with East Africa, and I will conclude it by offering a few remarks on the contrast between the two sides of the continent. Whereas in all that portion of East Africa which up to the present has in any way come under British influence, from the coast to Uganda, there are only petty chiefs of sections of tribes, or of village communities; in West Africa the position is entirely different. Great empires are ruled over by powerful kings, who can place in the field many thousands of horse and foot soldiers. The Sokoto empire is the head-quarters of the Hausa-speaking race, and it owns sway over great detached kingdoms ruled by emirs who acknowledge the commands of the king of Sokoto, and send him tribute. The principal of these kingdoms are Gando (which includes Gurma), Nupé, Ilorin, and Yola. These form the bulk of the up-country territories of the Royal Niger Company. It is not therefore possible in these districts to institute direct British rule, as it is in East Africa, where the only monarchy is that in Uganda, whose king has become a mere puppet in the hands of his chiefs; while rival factions and jealousies have thrown the whole burden of responsibility and of power into the hands of the British officials. In West Africa of to-day (whatever it may become in the ultimate progress of civilisation) it is necessary to work through and by these powerful kings and emirs; nor is it possible to institute arbitrary measures of reform, however desirable in themselves.

The slave-trade in East Africa has for some years past had the search-light of European public opinion turned upon it, and there may perhaps be some who have gained the impression that the Muscat Arab of Zanzibar is the sole delinquent in Africa in this respect. His influence has extended through the greater portion of East Africa, from Somaliland in the north to the Zambesi in the south, and it has penetrated to the west coast throughout the whole of the Congo State. But it is unknown in the Niger and Central Sudan regions. There the great Mohammedan empires of Sokoto, of Samory, of Ahmadou, and of Morocco, create a vast demand for slaves, and a vast slave-trade system. The Mohammedanism of these West African empires is of a very spurious sort, and is often largely mixed with paganism. In East Africa the advent of the Mohammedan Arabs has had the effect of checking to some extent indulgence in intoxicating liquor, and the prohibition of the Koran is observed by the great majority of respectable Arabs, and is imposed upon their Negro converts. In West Africa, however, even the Foulahs—the high-caste descendants of the Mohammedan conquerors, and the representatives of the creed of Islam—are themselves steeped in drunkenness. Captain Binger, the French traveller (himself an advocate of Islam), bears witness to the fact that in the Foulah towns which he visited he found the whole population, male and female, drunk after a certain hour of the day. If, however, the followers of Mohammed have done nothing to check the curse of intoxication in West Africa,

the nations which profess the Christian religion have done their utmost to increase it. In the Lagos Colony and Niger Coast Protectorates alone, some 4,000,000 gallons of the most poisonous gin and rum are imported yearly; and the revenues of these two British possessions are derived almost solely from this source, to the detriment of the natives and the exclusion of all but a very small proportion of articles of legitimate trade.

It is just to add that the Royal Niger Company has set its face resolutely against this pernicious traffic. North of the 7th degree of latitude, viz. in nineteen-twentieths of the territories, the importation of liquor is totally prohibited; while south of that degree, in the delta of the Niger, where total prohibition is impossible so long as alcohol continues to be poured into the neighbouring protectorates, every effort is being made to curtail and decrease the import. The total average import since the charter was granted has been only 163,000 gallons (as against nearly 4,000,000 in the Lagos and Niger Coast Protectorates), whilst last year not a single gallon was imported. To Sir G. Goldie, the governor and founder of the Royal Niger Company, is due the entire credit of this action.

My paper was intended to be solely geographical; but I find it is as hard to keep these questions of slave trade, liquor-traffic, and a dozen others out of any paper I write and read on Africa, as our old friend Dick found it to exclude the head of Charles I. from his conversation! Does it not appeal to you—apart from any moral issues, and divesting the subject for the moment of any moral aspect—that it is folly to cry out that our trade is depressed at home, while we import into our colonies and protectorates millions of gallons of foreign-made poison, instead of home-made barter goods, which are in great demand?

Physically, West Africa is very unlike East Africa. In the latter you begin gradually to ascend the moment you leave the coast, and reach 3000 feet elevation by the time the first zone of 200 miles is crossed. From that point you ascend to 6000 feet in a few marches, and the whole country thence to the Central Lakes varies from this to even greater altitudes. In West Africa there is no such central plateau, in the regions, at least, of which I speak. Consequently, the heat is very great, and the climate more tropical and enervating. During certain months of the year a wind blows from the direction of the Sahara called the "Harmattan." It is laden with impalpable sand-dust which irritates the eyes; and its effects are said to be very unhealthy. It certainly occurred to me that varying currents of hot and cold air were borne on this wind; and if so, one can readily understand its ill-effects on the constitution. At Lokoja, the only place at which I made any prolonged stay, the wind throughout the day (during March) blew with systematic regularity from the west, and exactly at sunset veered round and blew throughout the night with equal violence from the east. All this valley of the Niger is subject to tornadoes of very great velocity. They come like a veritable simoom, heralded by darkness and whirlwinds of sand and dust, causing great havoc and destruction, and are followed usually by a violent thunderstorm. Continual loss of life takes place on the Niger by the capsizing of any unfortunate canoes which may chance to

be caught in one of these hurricanes. British East Africa, though subject of course to tropical thunderstorms, is free from tornadoes, and, except perhaps towards the extreme north and the little-explored Lake Rudolf region, is free from wind-borne sand.

The Niger territories enjoy the advantages of a magnificent waterway in the noble river from which they take their name. For one hundred miles from the sea no one channel can be said to be the sole claimant to the name of the Niger, for an endless network of rivers and creeks branches off from the parent stream and forms a mighty delta. Above this point the river is in places over a mile broad; indeed, up to near the rapids about Jebba, 500 miles from the sea, the width is rarely much less. Its length is probably about 2500 miles. East Africa enjoys no such advantage in possessing as a highway for commerce a river navigable for light-draught steamers all the year round, and for vessels of great size during some months of the year. In order, therefore, to render the development of the country in any way possible, it has been necessary to undertake the construction of the Uganda Railway at the very inception of our Protectorate in East Africa, whereas the Niger Company from its initiation has been a commercial success without any such large initial capital outlay as is necessary for a railway. But in the long-run I have confidence in East Africa. If it lacks a great navigable river, it also lacks the unhealthy river valley. Those who enter the country will not do so along a malarial river waterway, but by means of a still more rapid method of transit, leading across healthy highlands, and continually ascending to the central plateau. Nor is East Africa destitute of water communication, for the railway will terminate on the shores of the second largest lake in this planet—the Lake Victoria—having an area of 27,000 square miles, out of which flows the Nile, navigable in sections for 2500 miles; while other great lakes lie close around.

Another striking contrast between East and West Africa consists in the fact that in the latter there is a written language—Hausa with the Arabic alphabet—and the rudiments of a literature. This is taught in the Mohammedan schools, and letters pass from district to district, written by the merchants or the scribes of the kings and emirs. An association, called the Hausa Association, on whose committee I have the honour to be, has been formed to promote the study of this language, which may be said to be the *lingua franca* from the shores of the Mediterranean to the Gulf of Guinea. The Royal Scottish Geographical Society has already expressed its sympathy with the objects of this association, and I trust you will give it your material support, for it is in need of funds. It seems to me to be a grand conception that Great Britain should influence the thought and progress in these great Mohammedan centres, by printing literature—not solely of a religious nature—in the Hausa language, and disseminating it among the educated Moslems of those distant and little-known cities. The Hausa student, Mr. Robinson, who was sent by the Association to study the language on the spot, has recently returned from the great Clapham Junction of West Africa—the city of Kano—and he has done most admirable work in compiling a

dictionary and grammar of the language, in spite of very great difficulties which it took no ordinary amount of courage, resolution, and perseverance to overcome. I hope that before long he will give a public account of his work and its results. I have here a small pamphlet—part of the Gospel of St. Matthew—transcribed into Hausa; he gave it to me in West Africa, and it is a sample of the class of printing, etc., which some day may issue from these islands, and help to break down the wall of Moslem prejudice in Central Africa, and so to convey to these distant places some reflection of European thought and literature.

I would like to draw out these comparisons further, and to contrast the peoples of East and West Africa, the soil, and the productions, vegetable and mineral, and above all the futures—the possibilities for development by the white races—of the two opposite sides of the continent. But I must not trespass further on your patience. I thank you for the kindness with which you have listened to me, and the indulgence you have shown to me. For my own part, with the memories of your kindness in 1892, and of the hearty and effective interest which Scotland took in the cause I then came here to advocate, it is a real pleasure to me to read a paper before the Royal Scottish Geographical Society.

NOTES ON VANCOUVER ISLAND.

By Alexander Begg, C.C., F.R.C.I.

There is, perhaps, no other island of its size in Queen Victoria's broad dominions which possesses as much interest at the present time, in relation to the Empire, as does Vancouver Island. Situated on the north-west coast of America, and occupying a position on the Pacific coast analogous to that of the British Isles on the coast of the Atlantic, it extends in a north-westerly direction parallel to the mainland, from the south-east, for a length of about 300 miles, with a breadth varying from 20 to 60 miles. The capital of the Province of British Columbia, Victoria, is situated near the east end of the island. It is connected by an electric railway with the town of Esquimalt and its commodious harbour, the naval station of the North Pacific.

The west coast of the island is indented by deep inlets, or canals as they are sometimes termed. One of these, the Alberni Canal, extends from Barclay Sound for over 20 miles into the interior, and is of sufficient depth along the whole distance to float the largest ships of the navy. Another inlet, also navigable by the largest ocean-going vessels, begins at Quatsino Sound, and crosses the island to within 7 miles of the eastern coast near Fort Rupert, so named by the Hudson Bay Company in honour of Prince Rupert.

Nootka Sound, near the centre of the island on the west side, first became celebrated by the arrival there of Captain Cook in 1778, on his third voyage around the world. The natives received him kindly. He

remained in the Sound only a short time to make some repairs to his vessels, and left under the impression that the coast was a portion of the mainland.

Soon after the report of Captain Cook's discoveries became known, and it was learned that valuable furs could be obtained in abundance from the natives of the north-west coast, traders of various nationalities began to arrive in ships flying the flags of their respective nations. The trade with the natives, chiefly for sea-otter skins, increased rapidly, and Nootka became the chief rendezvous of the various traders.

In 1788 John Meares, formerly a lieutenant in the British navy, arrived at Nootka with two trading vessels from China. He met with a friendly reception from the natives, and agreed with the Indian chiefs for the purchase of lands on which to establish a station for trading purposes and shipbuilding. Having erected suitable buildings on the land thus obtained, he returned with his vessels and furs to China, leaving instructions with skilled men as to the building of a vessel to be named the *North-West America*. In due time the vessel was built and launched. When Captain Meares returned on his second voyage, he found that a Spanish fleet had come north from the west coast of Mexico and captured the newly built vessel, had robbed his stores, taken his men prisoners, and destroyed his buildings. This outrage he reported to the British Government, and in consequence a convention was held at Madrid in 1790.

After much diplomatic correspondence between the courts of Great Britain and Spain—France, her ally, having proposed to join against Great Britain—the imbroglio, which almost led to war, ended in Spain agreeing to pay compensation to Captain Meares and his party (British subjects) for the losses and damage resulting from the seizure of his vessels and property in 1789. Commissioners were appointed by Spain and Great Britain to define the amount of the claim. They met at Whitehall, London, in February 1793, and decided that Spain should pay an indemnity of $210,000 in coin, in full settlement of all claims. It had formerly been agreed by the convention at Madrid that the Spaniards should evacuate Nootka. This in due time was carried into effect.

Captain George Vancouver, in 1790, was commissioned by the British Admiralty to see that the agreements with Spain were fully complied with; also to make explorations and surveys along the north-west coast of America; and to finally set at rest the question of a navigable passage between the Atlantic *viâ* Hudson's Bay and the Pacific Ocean. He arrived at the Straits of Fuca, April 1792. Proceeding along the Straits until the large opening leading southward was reached, he turned in that direction and surveyed those wonderful inlets, naming them Puget Sound, after his second lieutenant, Peter Puget, who had principal charge of that survey. Then proceeding northward, surveying as he went, he sailed westward around the north-westerly point of the island, and thence south-easterly until Nootka was reached, where he found Governor Quadra.

With the Spanish Governor Vancouver discussed the situation fully. On the one hand, Vancouver had instructions to receive from Quadra, in accordance with the Madrid convention, the buildings and tracts of land of which British subjects had been dispossessed in 1789. On his part, Quadra desired delay, as he had not received special instructions from his Government on the subject.

It was therefore agreed between them, that the whole matter relative to the transfer should remain in abeyance until further instructions were received; and that, in the meantime, the large island which Vancouver had just circumnavigated, should be named "Quadra and Vancouver Island." Quadra and his fleet left Nootka on 22nd September 1792 for his Mexican headquarters at San Blas. He died the following March. Vancouver left Nootka on the 12th of October for the Sandwich Islands, where he wintered.

Early in the summer of 1793, Vancouver returned to complete his explorations and surveys along the mainland. He called at Nootka, but received no despatches from England. He completed his surveys during the summer as far as Portland Canal and Clarence Strait, examining also Prince Ernest Sound, and, returning south, passed to the west or outside of Queen Charlotte Islands, calling at Nootka. Finding no despatches for him from England, he proceeded, *viâ* Monterey, to winter at the Sandwich Islands.

After the winter of 1793, Vancouver sailed north, direct to the Alaskan coast, to thoroughly examine those portions of the mainland coast southwards which he had not formerly surveyed. This work occupied the whole summer of 1794. It enabled him to report definitely that no navigable channel intersected the continent south of the latitudes which had been explored by Captain Cook and himself, and that the supposed hyperborean passage did not exist. He returned to Nootka in September, where he remained repairing his vessels until October. During that time he enjoyed the hospitality of the Spanish commander Alva (successor to Quadra), and exchanged courtesies with him.

No despatches having arrived from England or from the continent of Europe, both commanders at nearly the same date left Nootka for Monterey, where despatches would first arrive by the overland route. It was understood there that no alteration would be made from the wording of the convention of 1790; Vancouver, therefore, proceeded to England *viâ* Cape Horn. He reached his destination in October 1795, his mission having been highly successful; and he had the satisfaction of reporting that, during the long absence of four years and nine months, the *Discovery*, his flag-ship, had only lost one man by disease out of the complement of 100 men, and that the *Chatham*, his consort, had not lost one man either by illness or by accident.

"The Nootka difficulty" was not finally settled until another convention was held at Madrid in 1794, which resulted in an agreement being made, that "commissioners should meet, as soon as possible, on or near the spot where the buildings occupied by British subjects formerly stood, and there exchange declaration and counter-declaration as literally described in the document, which provided that, the preliminaries having been

complied with, the British officer shall unfurl the British flag over the land thus restored, as a sign of possession, and after these formalities the officers of the two crowns shall retire respectively to their people from the said port of Nootka."

The commissioners appointed to conclude the formalities sailed from Monterey, March 22nd, 1795. "By the morning of the 28th," the British officer, Lieut. Thomas Pierce of the marines, reports, "all the artillery were embarked, part on board his Catholic Majesty's ship *Activa*, and part on board of the *San Carlos* guardship. Brigadier-General Alva and myself then met, agreeably to our instructions, on the place where formerly the British buildings stood, where we signed and exchanged the declaration and counter-declaration for restoring those lands to his Majesty, as agreed upon between the two courts; after which ceremony, I ordered the British flag to be hoisted in token of possession, and the General gave orders for the troops to embark." The name of the island was changed to Vancouver.

No sooner had the Spaniards withdrawn from Friendly Cove, as the harbour was called, than the Indian Chief Maquinna transferred his subjects to the quarters which the troops had abandoned. No attempt was made to establish another settlement of white men at Nootka. Friendly Cove remains an Indian village as it was a hundred years ago; the only addition of white settlers is a storekeeper, who keeps on hand a small stock of goods of such sorts as are suited to the requirements of his Siwash (Indian) customers.

The sea-otter fur trade, however, continued to be carried on vigorously at Nootka, and was also prosecuted along the west coast generally. Traders were then at liberty to carry on their traffic in such ways as they considered most profitable; they sailed from cove to village, and in many instances took undue advantages of the unsophisticated natives. Intoxicating liquor of the vilest sort was freely introduced. Demoralisation and disease followed. The cupidity, greed of gratification, and the reckless improvidence of the natives, induced them to capture, in season and out of season, the sea-otters, which, notwithstanding their immense numbers, soon began to show the effect of indiscriminate and incessant slaughter.

The fur trade was carried on exclusively by sea until the year 1810, when the North-West Company, following up the explorations made in 1793 by Alexander Mackenzie (afterwards Sir Alexander), branched south by the Columbia river, and made the southern portion of that great water-course the principal route of trade and travel until 1821, when they amalgamated with the Hudson Bay Company; after which time that Company carried on the whole of the fur trade of British North America under their old name.

For about fifty years after the withdrawal of the Spaniards from Nootka, the Island of Vancouver was entirely in possession of the native tribes. In 1843, however, the Hudson Bay Company removed their headquarters from Fort Vancouver on the Columbia river to the south-eastern part of Vancouver Island, where they erected a fort and trading post, which at first was named Camosun, but soon afterwards, with its

name changed to Victoria, became the nucleus of the present city of Victoria.

The Company, expecting to profit from the immigration which had begun to come from the east to the lands near the Columbia river, obtained from the Imperial Government a grant or lease of the whole Island of Vancouver for colonisation purposes. The island was granted in January 1849 to the Company, together with its seas, and all mines belonging to it, for ever; subject only to the domination of the British Crown, and to the yearly rent of seven shillings, payable on the first day of every year. The Hudson Bay Company were to settle upon the island, within five years, a colony of British subjects, and dispose of the land for the purposes of colonisation at reasonable prices. Such lands as might be necessary for a naval station, and for other Government establishments, were to be reserved. Provision was made that, in the event of no colonisation being made at the end of five years, the grant should be forfeited.

It was next decided by the Imperial Government to form the island into a colony. Richard Blanshard was appointed Governor. He left England in 1849, but did not reach Victoria until 10th March 1850. He was received at the fort by the chief factor, James Douglas, and the officers of the Company, who, with the employés, assembled to hear the commission and proclamation of the newly-arrived Governor read. Governor Blanshard then returned to the ship, as there was no Government house, inn, or lodging provided on land to receive him.

The position which Governor Blanshard came to fill did not come up to his expectations, so next year he resigned, and returned to England in 1851. He was succeeded by Chief Factor James Douglas (afterwards Sir James), who at the same time retained his former position under the Hudson Bay Company. At the time of his appointment as Governor of the Colony of Vancouver Island (1851) he was raised to the dignity of C.B.

The government of the colony was autocratic until 1856, being administered by Governor Douglas and a Council, two of whom were nominated by Governor Blanshard. An election of seven residents was held in 1856, to form a parliament to represent the people in the local legislature. This arrangement was continued until 1859, when the second five years' lease of the island to the Hudson Bay Company terminated.

In consequence of the gold excitement in 1858, which brought thousands of miners to the Fraser river country, the Home Government considered it advisable to form the mainland into a new colony, to be named British Columbia. Governor Douglas was offered the appointment of Governor of the new colony in addition to that of Governor of Vancouver Island, on the condition that he would sever all connection with the Hudson Bay Company. To this he agreed, and his commission as Governor of British Columbia was proclaimed 19th November 1858; he took the oath of office the same day. New Westminster was proclaimed the seat of Government of the new colony of British Columbia.

The dual administration continued under Governor Douglas until his

term of office expired in 1864, when he retired. He was knighted in 1863. Great improvements were made in the city of Victoria during his term of office. It grew from a mere trading post to a city of commercial importance. Large settlements were opened up in the surrounding country. Farther north, on the east coast of the island, the Nanaimo coal mines were opened. Public buildings were erected in 1859. Those have done good service ever since, but are now being replaced by a magnificent pile of buildings, probably the finest combination of parliamentary and departmental buildings to be found on the continent of America. They are built of white igneous sandstone, which hardens on exposure to the air, and along with the exquisite design of the architect they present a handsome appearance. The legislature in 1893 voted $600,000 to meet the cost of the building.

The maintenance of two colonial governors, with their respective staffs, was found to be rather expensive for the revenues of the separate provinces to sustain; therefore the Colonies were united in 1866. Victoria was voted to be the seat of government for the united colonies by a majority of the representatives of both. This was ratified by an Imperial Act of her Majesty, and Victoria remains the capital of British Columbia. Governor Seymour, then at New Westminster, was transferred to Victoria. At his death he was succeeded by Sir Anthony Musgrave, who held office until 1871, when the Province of British Columbia was merged into the Dominion of Canada.

At the time of the confederation of British Columbia with the Dominion, the building of the graving dock at Esquimalt and the construction of a railway from Esquimalt to Nanaimo were arranged for. The railway was completed in 1887, and Esquimalt now possesses one of the best and most substantial dry docks on the Pacific Coast. The harbour, the naval station of the British fleet on the Pacific, is about three miles long by two wide, and has an average depth of about eight fathoms, with excellent holding-ground for anchorage. The dry dock, which was nearly three years in construction, is built of sandstone imbedded in cement; it is 457 feet long, 57 wide, and 27 deep. The machinery connected with the water-gates, valves, and pumping apparatus is of the latest and most perfect types of mechanical and engineering skill.

Vancouver Island is celebrated for the excellent quality of its coal; for the past year (1894) the output was 1,012,053 tons. The exports were 827,642 tons, of which San Francisco and California took 649,110 tons; the balance, with less than two weeks' production on hand at the end of the year, was shipped to Washington Territory, Alaska, to the Hawaiian Islands, etc. The northern end of the island overlies extensive coal measures. At Quatsino, near the mouth of the inlet of the same name, a new town and settlement have recently been established. Near at hand the outcrops of coal and borings give a prospect of an abundant supply of excellent coal.

A mere reference need only be made to the inexhaustible supply of edible fishes which swarm along the shores and on the deep-sea fishing banks. Unfortunately, but little has been done towards bringing this harvest of the sea to market, with the exception of the salmon. The

timber supply of the island is very large, and much of it of excellent quality, including extensive groves of cedar and Douglas pine, which flourish on the coast down to the limit of tidal water.

Judging from the newspaper reports respecting the work which is being done at the goldfields of Alberni, it appears that Vancouver Island holds a foremost place in the mineral regions of British Columbia. Professor W. J. Sutton, formerly provincial assayer, and more recently Assistant-Professor of Geology and Mineralogy in the Michigan (U.S.) School of Mines, has handed into the Minister of Mines a report, from which the following are extracts:—

"In taking a general survey of the country under consideration before entering into specific details, a glance at the map of Vancouver Island will show the rugged, mountainous nature of its interior. The mountains of Vancouver Island are comprised of four great ranges or systems of mountains within what has been called the Vancouver range, the most westerly of the four great ranges in British Columbia, forming the cordillera belt. Commencing on the east, we have first the Rocky Mountains, then the Gold range, next the Coast range, and, finally, the Vancouver range, all running more or less parallel in a north-westerly and south-easterly direction.

"The Vancouver and Gold ranges have many features in common in their auriferous schists and altered volcanic rocks. The Gold range, being composed of a number of minor ranges, namely, the Cariboo, Selkirk, Purcell, and Columbia ranges, has thus far produced most of the mineral wealth of the province of British Columbia. The Vancouver range is the north-western boundary of the continent of North America, as there is only a narrow submarine plateau extending beyond it, and then a quick descent into the azure depths of the Pacific.

"Comparatively little is yet known regarding the geology of the interior of Vancouver Island, partly owing to its rugged nature and thick undergrowth, partly to the limited amount of geological work thus far undertaken. The complications of structure presented can only be satisfactorily worked out by a comprehensive survey of the whole island, which properly comes under the purview of the Geological Survey of Canada, and I would respectfully draw your attention to the needs of the province in that respect.

"The Vancouver range consists for the most part of an enormous series of eruptive rocks, interbedded with limestone, argillite, quartzite, etc. This great mass of volcanic material and interbedded sedimentary rocks has been grouped together, and provisionally called the Vancouver series, by Dr. Selwyn. The series amounts to many thousands of feet in thickness, and will most likely be found to embrace not only Triassic and Carboniferous rocks, but others even lower in the geological scale. The limestone portion alone attains a thickness of several thousand feet, and Dr. Dawson has suggested that the series should be limited to the Triassic rocks, when they shall have been distinctly separated. The whole region has suffered great disturbance. Volcanic outflows on an enormous scale have occurred at repeated intervals, long periods intervening, during which the interbedded sedimentary rocks accumulated. The amount of volcanic breccia and tuff is also a remarkable feature, a large exposure of which may be seen along the Alberni road at Cameron lake. All this great series has undergone extensive metamorphism. The limestones have become highly crystalline, and contain few fossils. The argillites have become semi-crystalline and more or less chloritic schists. The eruptives, although originally basaltic and trachytic lava-flows, have undergone such alterations that we have now diabase, diorite, felsite, etc. A large propor-

tion might be called greenstone, their greenish appearance being due to the alteration products, such as chlorite, viridite, etc. Some of these extremely altered eruptives might, from a lithological standpoint, be regarded as very low down in the geological scale.

"The interior of Vancouver Island lying north of Cowichan lake and down to Alberni appears to be the remnant of a high, elevated plateau, the mountain peaks now remaining having an elevation of about 4000 feet, which is about the average height of most of the principal mountains of the island, the highest, Victoria Peak, having an elevation of about 7484 feet.

"Lying unconformably on the Vancouver series is quite a large area of Cretaceous rocks, forming a sort of fringe along the east coast of Vancouver Island, and embracing the coal areas of Cowichan, Nanaimo, and Comox.

"At the head of Alberni Canal there is a basin of sedimentary strata, consisting of sandstones, conglomerates, and shales, which have been classed as Cretaceous, but from observed lithological differences I am inclined to question whether they belong to the same horizon as the coal-bearing area of the east coast. A shaft was sunk in the shale near the head of the canal about seventeen years ago, but no distinct coal seam was exposed, although the shale was highly carbonaceous. I came across outliers of these sandstones and shales in the China creek basin, to which I shall have occasion to refer later on. I have also seen similar sandstone and conglomerate on the border of Cowichan lake.

"It is interesting to note in this connection that almost every creek and river on Vancouver Island shows at least one or two colours to the pan. Leech river, in particular, yielded a considerable quantity of gold to the hardy miners of the early sixties, variously estimated at from one to two hundred thousand dollars.

"China creek was worked for its alluvial gold as far back as 1862, principally by Chinamen, and has yielded about forty thousand dollars by the most primitive methods—the pan, shovel, rocker, and sluice-box. A good deal of gold has also been taken out of Gold river by the Chinese, but nothing definite can be obtained regarding its yield. The black sand along the north shore, especially at Cape Cormorant and Cape Scott, contains considerable fine gold similar to that found along the coast of Oregon and California.

"All the streams which have their sources in the auriferous belt under consideration show strong colours to the pan. I may mention the following: Cameron, Nanaimo, Nitinat, Cowichan, and Franklin rivers, China, Shaw, and Granite creeks. It must not be forgotten that placer gold has been naturally concentrated by an extensive erosion of the surrounding country, and it is not to be entirely depended upon as an index to the extent of the gold yet remaining in the hills.

"Along the trail from the Alberni settlement, several exposures of syenite can be seen. This syenite extends over a large area, and forms, I think, the archæan floor upon which the Vancouver series was laid; wherever met with it has been found to underlie all the other formations. It is a typical syenite, showing the hornblende in well-defined crystals, but considerably altered. It contains very little mica and a small proportion of quartz, although quartz occurs locally in sufficient abundance to make it a hornblendic granite. The syenite occurs as a bedrock along nearly the entire length of Granite creek, from which it has derived its name through the miners regarding it as granite.

"Small outliers of the sandstone previously mentioned are exposed along the trail, and it no doubt originally covered the whole valley, but has since been removed by denudation. It is overlaid with shale on China creek, and is exposed along the beds of Mosquito and M'Laughlin creeks, extending into the foothills,

and also forms a rim around Mount Patl Patlicant. There is a fine exposure of these strata at a high fall on M'Laughlin creek, where there is a perpendicular drop of 150 feet. Here they appear to lie horizontally, but passing round Mount Patl Patlicant to the west they form a spiral, and crop out near the top of the mountain on the south side. A good exposure showing this twist is on a bluff at the head of Child's creek. The most remarkable exposure of the sandstone is at its contact with the Vancouver eruptives, well seen in the bed of China creek. Here the sandstone dips under eastward at an angle of 60 degrees, which may be explained as a complete overthrow of the strata, or a reversed fault—the eruptives being supposed to antedate the sandstone. There is about two feet of fluccan, and the sandstone is very much indurated at the contact. The eruptives are also very much altered. The deepest section of these sedimentary strata amounts to about 600 feet of sandstone and 400 feet of shale. No evidence of coal has anywhere been seen.

"Mount Patl Patlicant has a capping of eruptive rock, probably a phonolite, which rests upon the shale above mentioned.

"The gold belt on China creek lies east of this sandstone, the formation being an almost typical section of the Vancouver series, consisting of diabasic, dioritic, and felspathic rocks, more or less schistose, with interbedded limestone, argillite, and quartzite. These eruptive rocks have undergone remarkable alteration, especially in the neighbourhood of Mineral creek, where they have become greenish grey schists, showing their eruptive origin only under the microscope.

"On the Alberni claim two veins of gold quartz have been exposed. The lower vein has about two feet of crystalline quartz, containing free gold disseminated through it in fine particles, and in some places plainly visible to the naked eye. The gold is associated with small grains of blende (black jack) in a somewhat peculiar manner, so that the presence of blende is an index to the occurrence of gold. The gold shows signs of crystallisation when highly magnified. The vein dips about 65 degrees to the east, with a strike of north 15 degrees east, and conformable with the bedding or foliage of the country-rock, and therefore may be classed as a segregated vein. The upper exposure of gold-bearing quartz is a narrow vein about a foot in width, cutting across the formation about north-east. The gold occurs in the same manner as in the other vein.

"The country rock of the Alberni claim is a greenish-grey schist, being an igneous rock highly metamorphosed through hydro-thermal agencies.

"Beyond these I have mentioned, very little work has been done on the claims in this section, so that it would be premature to form any definite conclusions regarding the permanency of the auriferous deposits. The majority of the veins are interbedded or 'segregated' veins, and have the appearance of being of somewhat lenticular character, similar to the quartz veins in the Alleghany mountains and a large proportion of the gold-bearing veins of California. They are good types of segregated veins, and contain the usual constituents—gold, pyrites, blende, galena, and chalcopyrite.

"Mineral creek follows the line of an interbedded stratum of calcareous material, or impure limestone, heavily studded with pyrites, passing through its entire length, for this limestone is softer than the neighbouring rock, and therefore more easily eroded by the watercourse.

"A number of other creeks in the neighbourhood were observed likewise following down the interbedded strata of limestone so common to that section. . . . The Golden Eagle basin, which is about ten acres in extent and completely surrounded by high, precipitous mountains, 4000 to 5000 feet in height, is beauti-

fully situated for a stamp mill or other works which might be needed in working the mines, and there is a plentiful supply of water and timber. The Golden Eagle is about half a mile from the cabin, and is reached by a gradual ascent of about 500 feet up the foot of Mount Saunders, which is covered with heavy *débris* from the mountain.

"The quartz vein upon which the work has been done is exposed along the ridge of a 'hog's back,' with snowslides on either side. The ridge is covered with timber, which serves as a protection from the heavy snowslides that would otherwise be a constant menace.

"The hog's back appears to be an intrusive boss of diorite which has undergone local metamorphism. At a short distance from the vein the hornblende of the diorite has undergone alteration to mica. Immediately adjoining the vein the mica diminishes, so that it becomes a leached felspathic rock which might be classed as a felsite. The vein has a banded structure, and has every appearance of being filled by lateral secretion and deposition, and possibly some replacement of the country-rock with vein matter.

"The ravine where the claim (King Solomon) is situated lies between Mount Saunders and Mount M'Quillan, at an elevation of nearly 4000 feet above sea-level, so that snow remains in the basin the year round. From what I was able to see, I should judge that the vein is a narrow seam along the side of a dyke. I was informed that it was widening below.

"The country-rock consists of schists cut through by numerous felsite dykes, which can be plainly seen running up the mountain side. These igneous injections produce conditions favourable to the concentration of the precious metals—in fact, it has been contended that the presence of gold in veins is always in conjunction with intrusive rocks, that the gold has been carried up with the outflow of these eruptive rocks. Without fully accepting this theory, it is generally believed by mining men that some eruptive action is essential to produce the necessary conditions for the concentration of metals in veins. The occurrence of auriferous deposits in conjunction with dykes is particularly exemplified throughout California, and, apart from any theory in connection therewith, we may naturally expect to find the same condition here.

"It is now well established that the metals occurring in veins in the form of ores have been deposited by the chemical solution of their ingredients from the surrounding country-rock. The principal difference of opinion, over which there has lately been a warm controversy, is with regard to the stress laid upon lateral secretion, or the ascension of the mineral-bearing solutions from great depths. . . .

"A number of claims have also been staked off in juxtaposition to the King Solomon, upon which very little work has been done. The ridge on the east side of the King Solomon Basin, of which Hanson Heights is the summit, is very much stained with iron oxide, due to the oxidation of the sulphurets with which the whole region is heavily charged. Hanson Heights is a highly crystallised diorite, being the same as the summit of Mount Saunders.

"On the trail, below the cabin on M'Quillan creek, is a notable outcrop of jasper or jaspillite—a name given to the rock by Dr. Wadsworth. Some of this jaspillite is heavily charged with hematite, and is identical with the jaspillite occurring in association with the great iron deposits of Northern Michigan. This is the only place where I found it *in situ*, although I met with float pieces all over the district. It may only occur as an inter-bedded layer similar to the quartzites in that locality. Adjoining it on the one side is a large bed of argillaceous schist, somewhat ferruginous, and on the other side are crystalline rocks.

"In passing down Alberni Canal from the settlement, carbonaceous shale can be seen exposed along the shore at the old Alberni sawmill site, lying almost horizontally. Farther along the shore of the canal, about a mile southwards, syenite crops out for a short distance, and is then replaced by a blackish, almost aphanitic diorite, which constitutes the body of Copper mountain. This formation extends along the shore down to a short distance below where the Esquimalt and Nanaimo railway boundary line crosses the canal, where syenite reappears and extends down to Hiwatches or Franklin river.

"A good contact of this blackish, fine-grained diorite with the syenite may be seen on China creek, the syenite dipping under the diorite westward at an angle of about 55 degrees.

"A most remarkable body of limestone crops out in what I have called Limestone mountain, at the head of Hiwatches river. There is an abrupt escarpment, almost perpendicular, of not less than 1000 feet of crystalline limestone, showing well the lines of stratification, and dipping about 15 degrees to the south. I did not succeed in obtaining any fossils, except a few crinoidal stems. A similar mass of the same kind of limestone occurs on the west side of Mount Douglas, showing a good exposure on the east side of Hidden lake, the vertical section being about 500 feet. All these limestones are highly crystalline and more or less dolomitic. They bear a great resemblance to several other large deposits on the island, such as at Horne lake, Kennedy lake, Nootka sound, and on Texada island. . . .

"In one spot on Granite creek I came across some chalcopyrite associated with molybdenite. It is interesting to note the common occurrence of molybdenite throughout British Columbia in association with copper ores; it has been found in numerous places but only in small quantities. . . ."

From the foregoing it will be apparent that Vancouver Island is the western bulwark of the Dominion of Canada; and that, as the Province becomes better settled and its resources more fully developed, it will, along with the island, not only maintain but exceed in value and importance its present high position.

THE ATLAS OF SCOTLAND.[1]

From the point of view of the Royal Scottish Geographical Society, the publication of this very fine Atlas of Scotland is an event of national importance. There is a sense in which the Atlas may be said to owe its existence to the Society. We do not refer to the fact that the name of the Society appears as sponsor on the title-page. We mean to say that, but for the foundation of the Society, and the deeper and wider interest in Geography which it has awakened by its meetings and its publica-

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[1] *The Royal Scottish Geographical Society's Atlas of Scotland, a series of sixty-two plates of Maps and Plans illustrating the Topography, Physiography, Geology, Natural History, and Climate of the Country.* Designed and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S., Hon. Sec. R.S.G.S. Edited by—Topography, John Bartholomew, F.R.G.S. (died 1893); Geology, Sir Archibald Geikie, LL.D., F.R.S. etc.; Physiography, Professor James Geikie, LL.D., F.R.S., etc.; Meteorology, Alex. Buchan, LL.D., F.R.S.E. Drawn, engraved, and printed at the Edinburgh Geographical Institute, 1895.

tions, it is very doubtful whether so great an undertaking as the production of a national Atlas would have been projected, or could have been carried through with any warrantable expectation of success. The national importance of the achievement, however, consists first in its being a national boon, and secondly in its being a national credit. It is a boon to Scotsmen to have placed within their reach such a splendid delineation of their country in its varied physical aspects—a delineation so comprehensive in conception, so elaborate in its details, and so accurate in every respect. It is not less a credit to Scotland that both in conception and in execution the Atlas is the work of Scotsmen. Scottish enterprise projected it, and Scottish ingenuity, skill, and taste have carried it through all its stages from first to last. It seems to us that the Society has done nothing but its duty in giving official support and moral encouragement to so important a national undertaking; and it is not less fitting that Her Majesty the Queen has graciously permitted the work to be dedicated to her.

The present work, though the latest and most complete, is by no means the first Atlas of Scotland given to the world. One of the most valuable of the introductory chapters of the book is a chronological summary of the history of Scottish Cartography by Mr. J. G. Bartholomew, to whom as the main projector and general editor of the Atlas the greatest praise is due. It is unnecessary to follow Mr. Bartholomew's table, which contains no fewer than 174 entries, in detail. But it may be useful to note the more important items, and especially those that refer to complete Atlases of Scotland. The earliest of these, of course, is Blaeu's great *Atlas*, published at Amsterdam in 1654, in eleven volumes. The volume relating to Scotland comprised 46 plates, and incorporated the results of the labours of Timothy Pont (1609), and of his successor Robert Gordon of Straloch, whose *Scotia Antiqua* was published, also at Amsterdam, in 1650. Indeed, it is a curious fact that all the early maps of Scotland were published abroad—in Rome, Venice, Bâle, Rouen, and Amsterdam. The next important landmark was reached by J. Adair (1688), whose maps, published in Paris, inaugurated a new era in cartography. Many separate maps were issued during the next hundred years; but nothing of permanent value was effected until Ainslie produced his new and original map of Scotland in 1789. Ainslie's map was in turn superseded by that of Arrowsmith (1807), which was constructed from original materials, and which, incorporating the results of the military survey of 1747-55, was the best map of Scotland at the date of its production. That was followed in 1832 by Thomson's *Atlas of Scotland*, containing a map of each county, and described by Bartholomew as "a monumental work." That was followed by the county maps prepared by Lizars for the *New Statistical Account of Scotland* in 1845, and by the *New Travelling Map* of Keith Johnston in 1857. Since that date, the best maps of Scotland have been those of the Bartholomews, father and son, including the reduced Ordnance Survey maps, first in 16, and ultimately in 29 sheets. In the present Atlas, Scotland is treated in 45 sheets, on the scale of $\frac{1}{2}$ inch to the mile; and while it thus bears an accidental resemblance to the great Atlas of Blaeu, which contained 46 sheets,

there is really no comparison between the two works, which are the products of widely-separated periods, and were therefore produced under wholly different conditions of art and knowledge.

It may thus be said without exaggeration that this Atlas represents in the most complete form the present state of geographical knowledge regarding Scotland; and, further, that it exhibits the art of the map-maker and the engraver in the highest perfection yet reached. Thus every one of the forty-five sectional maps, which, as has been said, form the most important feature of the Atlas, is a work of art pleasing to the eye of the uninitiated; but, to the expert, they are much more than merely beautiful objects. The delicate gradations of colour on land and sea are not intended merely for pictorial effect. They are graphic translations of the message which the contour lines convey with more formal accuracy. That contours and shadings represent a great deal more than appears on the surface, we have the testimony of Professor James Geikie, in the admirable paper on "The Physical Features of Scotland," which he contributes to this Atlas. He says :—

"In the case of the Ordnance Survey Map on the scale of 1 inch to a mile, the varying forms of the surface are so faithfully delineated as frequently to indicate to a trained observer the nature of the rocks and the geological structure of the ground. The artists who sketched the hills must indeed have had good eyes for form. So carefully has their work been done, that it is often not difficult to distinguish upon their maps hills formed of such rocks as sandstone from those that are composed of more durable kinds. The individual characteristics of mountains of schist, of granite, of quartz rock, of slate, are often well depicted; nay, even the varieties of igneous rock which enter into the formation of the numerous hills and knolls of the lowlands can frequently be detected by the features which the artists have so intelligently caught.

"Another set of features which their maps display are those due to glaciation. These are admirably brought out, even down to the smallest detail. A glance at such maps as those of Teviotdale and the Merse, for example, shows at once the direction taken by the old *mer de glace*. The long parallel flutings of the hill-slopes, *roches moutonnées*, projecting knolls and hills with their "tails," the great series of banks and ridges of stony clay which trend down the valley of the Tweed —these, and many more details of interest to specialists, are shown upon the maps. All over Scotland similar phenomena are common, and have been reproduced with marvellous skill on the shaded sheets issued by the Ordnance Survey. And yet the artists were not geologists."

What Professor Geikie says of the large-scale maps holds good with almost equal truth of the reduced maps in this Atlas. The editor is, however, careful to point out that the contour lines both for the height of the land and for the depth of seas and lakes, are given only "as far as surveyed." Thus the bathymetric lines are shown in the cases of Loch Lomond, Loch Awe, and Loch Tay, but not in the cases of Loch Katrine, Loch Ericht, and some others.

Other useful features of these sectional maps deserve to be noted. They show for the first time the corrected boundaries of counties and parishes as determined by the recent Boundary Commission. They

show all completed lines of railway, and they indicate those projected or in progress, and for this purpose the sheets have been revised by the companies concerned. Not only are all railway stations shown, but those having refreshment-rooms are differentiated by a special symbol. The steamer tracks are marked both on the coasts and arms of the sea, and on inland lakes like Loch Lomond and Loch Awe; and these tracks, like the railways, have been revised by the companies. The main driving roads are distinguished from the less important, and these from drove roads and footpaths. Canals also have their special mode of representation. It must be evident from this enumeration that for political and social, as well as for physical, features, these maps are as complete and instructive as they could possibly be made. As a supplement to these maps there are eight sheets of beautifully executed plans of the most important towns—Edinburgh, Glasgow, Greenock, Paisley, Dundee, Aberdeen, Stirling, Perth, Oban, and Inverness.

The other contents of the Atlas are of a general character; apply, that is to say, to the country as a whole. First we have a pair of physical maps of Scotland side by side—the one bathy-orographical, the other showing the boundaries of river-basins. Professor Geikie's paper, already referred to, is given in connection with these maps, and they are made more interesting by his exposition. The second pair of maps is also instructive. The one shows, by variety of colouring, the land surface features—ploughed land, woodland, and moorland. The other indicates the density of population by means of depth of shading. To a certain extent they illustrate each other; for the population is thinnest on the moorland districts, and is denser on the cultivated land; but it is, of course, densest in the mining and manufacturing districts, which are not otherwise indicated. In the population map, the sizes of the towns are represented by circles of different diameter. The actual populations of some hundreds of towns are given in a separate table. There are also tables showing the population of the counties at each decennial census for one hundred years, and the present density of the population in each county; the areas and the acreage of each county under different forms of cultivation in 1893; and the occupations of the people in six classes in 1891.

Next come two double sheets illustrating meteorological features—the one, rainfall; the other, temperature. Each double sheet contains twelve small maps of Scotland, one for each month, indicating by gradations of colour the areas of greatest and least rainfall, and those of highest and lowest temperature. Accompanying these comparative maps, there is a series of carefully prepared and exhaustive tables by Dr. Buchan. The first table gives the monthly and the yearly rainfall at ninety-two stations on a comparison of the data of twenty-five years (1866-1890). According to this table, the wettest place in Scotland is Glengyle, Perthshire (92·71 in.), and the dryest is Nairn (23·33 in.). The second table shows the mean monthly and annual temperature at eighty-nine stations on the average of twenty-four years (1857-1880). Excluding St. Kilda, it seems that the mildest places in Scotland are Rothesay, Cargen, and Harris (47·8°), and that the coldest is Braemar (43·3°).

These maps are followed by a very fine and very complete geological map of Scotland, occupying two double sheets; and as a companion to this there is a remarkably succinct and lucid paper by Sir Archibald Geikie on the geological formations of the country.

Next comes a series of four maps illustrating the Natural History of Scotland. The first shows the distribution of mammals, the second that of birds, and the third that of fishes, while the fourth shows the deer forests, the boundaries of the salmon-fishing districts, and the limits within which beam-trawling is prohibited. The last map also indicates the position of all the lighthouses on the coasts.

The last pair of comparative maps has been specially prepared by Mr. Friedrich Bosse to illustrate the distribution of languages in Scotland in 1881 and in 1891. They show how, during the decade, there has been a shrinkage of the purely Gaelic-speaking areas, and an extension of the partially Gaelic-speaking and of the English areas. According to these maps, however, the purely English, or "no Gaelic," districts in the east of Scotland, from Aberdeenshire to East Lothian, and also in Galloway, were more extensive in 1881 than in 1891. The small inset maps give the same impression. This seems at first sight incredible, but probably indicates that there was a considerable migration during the decade from the Highlands to the east and south. An explanation should have been given in a note. Connected with the subject of language, there is a valuable table by Dr. Burgess, on "The Etymology of Place Names in Scotland."

If this important Atlas has a defect, it is that it does not contain an industrial map. The coal-measures are, of course, indicated in the geological maps, with a special section across the Carboniferous rocks; but an enlarged map of the midlands of Scotland, showing the mining districts and the seats of the chief manufactures, would have made it complete. This omission may yet be remedied. As it stands, however, the Atlas of Scotland is a work of great merit, reflecting the highest credit on all who, with head or by hand, have assisted in its preparation.

W. Scott Dalgleish.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Annual Business Meeting.

This meeting was held in the Society's Hall, Edinburgh, on November 15th. Sir John Cowan, Bart., took the chair.

On the recommendation of the Council, the Marquis of Lothian was re-elected President, and the Vice-Presidents were also re-elected. The Duke of Hamilton was added to their number.

The following twelve Members of Council, who retire by rotation, were re-elected:—Captain Hamilton Dunlop, R.N., Dr. Rogerson, Mr. John Stephen,

Mr. Victor Fraenkl, Professor Pirie, Mr. Faithfull Begg, M.P., Mr. R. A. Robertson, Dr. George Smith, Dr. James Burgess, General Sir R. Murdoch Smith, Mr. J. W. M'Crindle, and Mr. W. B. Blaikie.

The following ten Members of the Society were elected in place of the other eight Members of Council who retire by rotation, and of the Hon. J. Abercromby and Mr. D. M. Westland, who resign :—Professor G. A. Smith, Dr. Freeland Barbour, Viscount Dalrymple, Dr. R. A. Ferguson, Mr. J. Struthers, Mr. James Buchanan, Bailie James Pollard, Mr. R. A. Lockhart, Dr. Alex. Buchan, and Mr. Lewis M'Iver, M.P.

Mr. David MacRitchie was appointed Hon. Librarian, in the room of the Hon. J. Abercromby, who resigns the office ; and the other Office-Bearers were re-elected.

The Report of Council for the Session 1894-95 was read by the Secretary, and passed on the motion of the Chairman, seconded by Miss Flora Stevenson.

The Anniversary Meetings.

At Edinburgh, the Anniversary Meeting was held in the Synod Hall, Castle Terrace, on November 5th. The chair was taken by the Marquis of Lothian, President of the Society. Captain F. D. Lugard, C.B., D.S.O., read a paper on West Africa, and was awarded a vote of thanks, on the motion of the Rev. Dr. J. H. Wilson. Lord Reay proposed a vote of thanks to the Chairman.

Mr. J. Theodore Bent delivered the Anniversary Address at Glasgow, on November 7th, his subject being "Southern Arabia." Sir W. Renny Watson presided.

The Dundee Branch held its Anniversary Meeting on November 14th, when Captain F. E. Younghusband, C.I.E., gave a lecture on "Chitral." The chair was taken by Mr. I. J. Weinberg, who proposed a vote of thanks to the lecturer.

At Aberdeen, the new Session was inaugurated on November 18th. Captain Younghusband, who was to have addressed the Branch, having been suddenly called to London, his paper was read by the Secretary of the Society. Professor Dove Wilson presided.

Other Meetings in November.

On November 8th, Mr. Bent repeated his lecture on "Southern Arabia," in the Society's Hall, Edinburgh. Mr. R. Cox, M.P., presided.

On November 27th, the Rev. C. H. Robinson, the Hausa Association Student, delivered in Edinburgh a lecture entitled "Hausaland, or 1500 miles in the Western Sudan."

Meetings in December.

A lecture will be delivered in Edinburgh, on December 5th, at 8 P.M., by Mr Lionel W. Lyde, M.A., on "The Teaching of Geography."

On December 19th, Mr. C. E. Borchgrevink will narrate his experiences during the voyage of the *Antarctic* to the South Polar continent, at 4.30 P.M.

Mr. Borchgrevink will lecture at Glasgow also, on December 20th.

A Christmas lecture to young people will be delivered, in the Society's Hall, Edinburgh, by Mr. J. C. Oliphant, M.A., on December 27th, at 4 P.M.

GEOGRAPHICAL NOTES.

By The Acting Editor.

EUROPE.

The Desert of Platé.—Professor Émile Chaix has forwarded to us a pamphlet, in which he describes the work he has accomplished in investigating this *Karrenfeld*, which lies in Haute Savoie between Samoëns sur le Giffre and St. Gervais-les-Bains. It is surmounted by the Tête Pelouse and the Grands Vans on the north; the Pointe de Platé on the south; the Pointe du Colloney on the south-west; and the Haute de Véron and the Croix de Fer on the west. It may be approached by the valley of Flaine, from Bellegarde, the valley of Salles, the valley of Gers, or from St. Gervais or Sallanches.

The principal ridge of this desert extends from the southern foot of Tête Pelouse in a south-south-westerly direction towards the Aiguille de Platé, from which it is separated by a depression. At the foot of Tête Pelouse it has an altitude of 7716 feet, and rises uniformly to its culminating point at a height of 8123 feet. The eastern slope descends towards the valley of Salles with a fall at first gentle and afterwards very steep. The western slope is very different. After a few steps comes a wall of nummulitic limestone almost precipitous, which descends in two or three sections from a height of 7700 feet to 7200 or 7400. Here is a narrow grassy flat named the Langards, below which commences a gentle slope of Urgonian rocks. The whole area of the *lapia*, or *Karrenfeld*, of Platé is about $5\frac{3}{4}$ square miles.

The aspect of the desert is not the same in all parts. A forest of fir ascends up to about 6500 feet, shading rocky ground studded with holes which are concealed by rhododendrons. A few solitary and stunted specimens of *Pinus montana* are seen as high as 6900 feet. At about 6000 feet the pastures commence, fairly good at first, but more and more broken by protruding stones as they ascend, and gradually thinning out between the rocks at a height of 7400 to 7700 feet. At length nothing is visible but bare rock, which yields a meagre support to a few herbs and small flowers. It becomes more and more ravined and fissured, until at the top of the ridge it is a complete chaos.

Professor Chaix divides the forms of erosion into two classes: superficial chisellings and crevasses. The former are always shallow, whether they take the form of numerous closely packed runnels, furrowed flats and hillocks, or rectangular slabs. These are evidently due in the main to the chemical action of rain-water in some way or other, though mechanical action, as for instance, in some cases, frost, may have modified the forms. The origin of the crevasses, the largest of which attains in some places a breadth of at least 26 feet and as great a depth, is not so easy to explain. Sub-glacial erosion can account for only a few. The theory of torsion or compression is plausible, but demands fuller proof.

Professor Chaix discusses fully all the various forms of erosion and the origin of certain circular pits, and his pamphlet contains a large number of excellent illustrations and a map of part of the desert.

Meteorological Observatory on Monte Cimone.—Last month this observatory was mentioned in a list of high-level observatories. Particulars about it are given by Mr. A. Lawrence Rotch in the *American Meteor. Journal* for November. Its installation was due to the efforts of Signor P. Tacchini, now Director of the Central

Meteorological Office at Rome. Monte Cimone is the culminating point of the Northern Apennines, and rises from the Pass of Abetone, behind the Baths of Lucca, into two peaks, on the higher and northern of which (7100 feet high) the observatory is situated. The building consists of an octagonal tower, 26 feet in exterior diameter, and 46 feet high. It has three stories and a roof, on which the wind instruments and rain gauge are exposed. A barograph and thermograph were constructed for the observatory and operate for three months without attention. During the summer of 1892 six eye observations were made daily under the direction of Signor P. Videmari, who has for several years maintained a base station, also provided with self-registering instruments, at Sestola, 45 miles east of, and 3500 feet below, the mountain top.

ASIA.

Redetermination of the Longitude between Greenwich and Madras.—The present longitude of Madras, to which those of other Indian stations are referred, was determined by Sir George Everest's lunar observations in 1830, and is known to be over two miles wrong. The difference of longitude between Bombay and Suez was ascertained by the great Trigonometrical Survey of India in 1877, and that between Suez and Greenwich by the British Transit of Venus Expedition in 1874. But the latter has not been checked, and was not executed with the precautions necessary for purely geodetic operations. As long as India was, as it were, isolated, the uncertainty respecting the longitude of Madras was not of much consequence: indeed the meridian of Madras might have been taken as a new initial meridian. But, since surveys have been extended into Afghanistan, Baluchistan, and Persia, the officers in charge have experienced serious inconvenience, and a reliable determination of longitudes has become necessary. In November last year Captains S. G. Burrard and G. P. Lenox-Conyngham, R.E., commenced work. Karachi had already been joined to Madras, so they proceeded to measure the arcs Karachi-Jask and Jask-Bushire, and the results were checked by a measurement of the whole arc Karachi-Bushire. In August last the arc Greenwich-Potsdam was determined by telegraph, to check the differences Greenwich-Berlin and Berlin-Potsdam, previously obtained. Captain Burrard was at Potsdam in October, and Captain Lenox-Conyngham at Teheran, engaged in the measurement of the arc between these stations, which they expected to complete in November. The entire connection will next be completed by the measurement of the Bushire-Teheran section.—*The Geographical Journal*, November.

The Takla-Makan Desert.—In the *Verh. der Gesell. für Erdkunde zu Berlin*, Bd. xxii. No. 7, is published a letter from Dr. Sven Hedin describing his journeys along the Kashgar Daria and across the desert to the Khotan Daria. Leaving Kashgar on February 17th he travelled along the river to Maral-bashi and then made an excursion in an east-south-easterly direction to the Mazar-tag, a fairly large elevation extending north-west to south-east, and composed of fine light-green and rather hard crystalline slate. The surrounding country is called Mazar-alldi (before or beside the Mazar). The inhabitants cultivate chiefly maize and wheat, and possess sheep, goats, and other domestic animals. They informed Dr. Hedin that in the neighbourhood the Yarkand Daria divided into two arms, the smaller running at a distance of five miles to the south, and the larger at a distance of seven and a half; the ground between them consisted of moist loam, flooded in summer with a great depth of water which froze in winter. Two and a half miles to the east, they added, the smaller arm entered a large lake, the Tiong-kul, into which the Kashgar Daria also poured a part of its waters. In the neighbourhood were

two smaller lakes, Kullolock and Sysuck. The larger arm flowed directly east, towards the Lob-nor. South-west of Mazar-tag lay the lake Shor-kul, which, notwithstanding its name, contained fresh water; consequently it is probably, like the others, caused by floods. The Mazar-tag continued to the south-east of the Yarkand Daria, gradually decreasing in height.

On reaching the Kodai Daria, the southern arm of the Yarkand Daria, Dr. Hedin found it to be 120 yards broad. Everywhere was seen alluvium of fine sand brought down by the floods, which attain their maximum in June, when the water extends up to the foot of the mountains, forming a large lake. On the right bank are fine pasture lands and thick jungle. Crossing the Mazar-tag westwards by a pass between two peaks of bluish-black and very hard porphyry, Dr. Hedin reached the Shor-kul, an extensive sheet of water full of small islands and reeds.

Having made an excursion across the Kashgar Daria to Tumshuk, and failed to procure camels at Maral-bashi for his journey across the desert, Dr. Hedin turned southwards to the Yarkand Daria again. A ferry at Lailik gave him an opportunity of gauging the river, which had a breadth of 67 yards, and a maximum depth of $6\frac{1}{4}$ feet; its average velocity was 32 inches, and its discharge 3058 cubic feet per second. The temperature of the water was (in March) 47° F., and its transparency only $1\frac{1}{2}$ inches; it was, therefore, rather muddy. The Yarkand Daria seems to have a tendency to move to the right, like the rivers of Western Turkistan.

From Lailik Dr. Hedin made an excursion to Ordan-Padishah, the grave of a saint, visited twenty-one years ago by Bellew. The country between the Yarkand Daria, Ordan-Padishah, Kashgar, and the Kashgar Daria is not entirely a desert, as it would seem from maps. Routes cross one another in several directions, passing here and there through small settlements, the largest of which is the twin villages Terem-Mogal, a long day's journey north-west of Lailik. Each of these has about two hundred houses and extensive plantations irrigated by water drawn principally from the Gez Daria. Between Terem-Mogal and Ordan-Padishah, to the west-south-west, swampy hollows are numerous. Here, too, lies a lake of some size, the Bayehan-kul. To the north and east of Ordan-Padishah sand stretches continuously for two or three miles, and on its northern border is another lake, at the foot of the small Mazar Kizil-ji-khanem. Both these lakes contain salt water.

Returning to Lailik, Dr. Hedin crossed the Yarkand Daria and stayed at Mesket, a large village about three miles from the right bank of the river. The cultivation here is very extensive, the fields being irrigated, not from the Yarkand river, but from the Tiznaf Daria. In summer the superfluous water is collected in two lakes to the north-east, named Bolbillek and Shemshi, which at other seasons are dry.

Having obtained camels from Karghalik, Dr. Hedin left Mesket on April 10th for the desert of Takla-Makan, travelling east-south-east, and reached the edge of the sand at a distance of ten miles. On the second day deep sand compelled him to turn towards the north-east. Tracks of wild camels and horses were seen, and many pools were passed filled by the Yarkand river, which was not far off, in time of flood. On the 18th the Mazar-tag came in sight to the north-east, and two large lakes full of islands and reeds were passed. At the foot of the mountains a narrow water channel forced the party to turn southwards. This channel presently spread out into a lake divided into several basins of excellent sweet water lying between mountains on either side. Riding between these ranges they came to another very long and narrow lake which gradually passed into swamps and small pools, round which they were obliged to make a long detour. First the western range came to an end, and then the eastern, and the open desert was reached.

As Przhevalski in 1884-85 travelled along the Khotan Daria to Aksu, he saw from the left bank, in lat. 38½° N., a small mountain Mazar-tag, stretching north-westwards as far as the eye could see, and on his map wrote that it extended as far as Maral-bashi on the Kashgar Daria. Being at the Mazar-tag mountains, Dr. Hedin thought that five days' journey would bring him to the Khotan Daria. He journeyed, then, south-eastwards and soon came to sand-dunes 20 to 25 feet high. They seemed to follow two directions, north to south and east to west. The steeper sides sloped towards the west, south-west or south. The dunes lying east to west were the larger, but those in the other direction far more numerous.

The remainder of the letter describes a disastrous march across the desert. The man who had been ordered to provide water for ten days had only taken sufficient for four. But the distance was longer than was supposed, and no water was found from April 23rd until May 5th. Consequently the sufferings of the party were extreme, and two men and four camels perished. At length the bank of the Ḳhotan Daria was reached near Bash-Kurla.

AFRICA.[1]

From the Upper Niger to the Ivory Coast.—Marchand's expedition in 1893 and 1894, during which 2500 miles of country was traversed, had for its object to discover the shortest and most convenient route between the Upper Niger and the Ivory Coast. The explorer's idea was that the Cavally would be found to afford the best line of communication, for it approaches near to the Bagoë-Bani, which flows into the Niger, the portage between them being some 120 miles. He found, however, that the Bandama possesses greater advantages. It passes through the forest zone to the north of the Guinea Coast at its narrowest part—about 55 miles—and its lower course is interrupted by only one rapid, above Tiassale. The highest navigable point of this river is separated from the head of navigation on the Bagoë by an interval of only 60 miles. But the opening of this trade route must be postponed until the power of Samory is completely broken.—*Globus*, Bd. lxviii. No. 17.

Lake Moero.—On arriving at the lake from Mpueto, a village nearly two and a half miles to the north, the traveller wonders why the Luapula has forced its way through the mountains at the north-western extremity, when a plain two or three miles farther east gave it ample room to expand. The reason is that at the time the river found an outlet the lake extended much farther to the north-east, where is seen a marshy plain bounded by the mountains which skirt the lake on the north and east. The outlet was formed by the river bursting through horizontal strata veined with schist. Issuing in a direction parallel to the northern chain, the Luapula, after a course of about half a mile, turns suddenly to the north. A few hundred yards farther it encounters the Kwadelungu mountains, and again turns sharply westwards through an opening not more than 40 yards wide. Where it first turns northwards the river has a breadth of 190 yards, of which 40 are occupied by a fall two and a half feet high, and the remainder consists of rapids. A pole 16 feet long failed to find the bottom, in October, at the outlet of the lake. But the depth at the beginning of the river's course is very variable. The current is imperceptible except at the rapids. Hippopotami, crocodiles, and fish are numerous.

During the past twenty years the level of the lake has probably fallen five or six feet, and perhaps twice as much in the last thirty or forty, leaving immense plains in the south-west and north-east. This fall of level is shown by the sands thrown

up near to Mpueto. The altitude of the first line of elevations is, in the northern part, only about 150 feet; in the south it is somewhat greater. Of the watercourses which open into this part of the lake only the Muntemume contains water throughout the year. It forms a cascade 100 feet high at a distance of 300 yards from its mouth at Kipunga. If the lake continues to fall at the same rate, Kilwa will become a peninsula in the next century.—From a letter of Captain Deschamps in the *Mouvement Géographique*, No. 19.

AMERICA.

Anticosti.—This island lies at the mouth of the St. Lawrence, and has a superficies of about two and a half million acres, or larger than that of Corsica. Discovered on August 15th, 1535, by G. Cartier, it was conceded to L. Jolliet in 1680, and from that time has always been private property. The successive owners have never tried to develop its riches, but have confined their supervision to the protection of the forests, fur-bearing animals and fisheries, and have permitted only temporary settlements to be made on the coast. In consequence, the island is almost as little known as on the day of its discovery. It is inhabited by only 500 persons, who are engaged in fishing, and the interior, with its 2900 square miles of forest, where roam thousands of black bears and other fur-bearing animals, is quite unexplored. A company, which has recently come into possession of the island, has decided to prepare a map of the coasts and the interior, to explore the forests and rivers, to inquire into its mineral wealth, and study its fauna and flora and the means of colonising the island, and developing all its natural resources. At the head of the expedition is Mr. P. Combes, a writer on geographical subjects; he will be accompanied by M. Dujardin-Beaumetz, civil engineer, a fisherman, and a Canadian voyageur.

The United States Census of 1890.—Part I. of the *Report on the Population* has just been issued. The population (exclusive of Alaska) was 60,622,250, as reported in vol. vii. p. 444, where some details were given from *Census Bulletin*, No. 16; and the area 3,025,600 square miles. In computing the density the land surface only has been taken, and Alaska and Indian Territory have been omitted. Thus calculated, the density in 1890 was 21·31 as against 17·29 in 1880. The most densely populated states have for ninety years been Rhode Island and Massachusetts, with 318·44 and 278·48 inhabitants to the square mile, respectively. The white inhabitants of the country in 1890 numbered 54,983,890, of whom 34,464,247 were of native, and 20,519,643 of foreign, parentage. The coloured population consisted of 7,470,040 Negroes (including half-castes), 107,475 Chinese, 2039 Japanese, and 58,806 civilised Indians. The percentages of Whites and Negroes were 87·80 and 11·93 in 1890, while in 1880 they were 86·54 and 13·12.

Alaska, with an area of nearly 600,000 square miles, had a population of 32,052, of whom 4298 were Whites, 23,531 Indians, and 2288 Mongolians. The number of Indians in Indian Territory and the Reservations was 189,447, making, with the civilised Indians and those of Alaska, a total of 271,784. For other notes on the census see vol. vii. pp. 327, 500, and 576.

Sunshine in California.—Records of sunshine have been made by the Weather Bureau at San Francisco since April 1890, and a record has also been kept at San Diego. The records at San Francisco show that it enjoys on an average 58 per cent. of the possible sunshine, and that the month of June has the largest amount, the percentage of the possible being 70, while December has only 43 per cent. But even this is 1 per cent. more than the average at Cleveland, Ohio, for the year

1893. The monthly averages at San Francisco, based on the five years' record are: January 52 per cent.; February 52; March 52; April 63; May 59; June 70; July 69; August 57; September 61; October 64; November 57; December 43. It may be seen that from April to November inclusive there is more than the average 58 per cent. of sunshine, and less from December to March inclusive. The latter are the rainy months, yet the average of these is 50 per cent., which is above the average annual sunshine in the New England and Middle States, and over Kentucky, Ohio, Indiana, and the region of the Great Lakes.

At San Diego there was 68 per cent. of the possible sunshine during the year 1893. August had the maximum amount, 76 per cent., while March had only 56. —*American Meteorological Journal*, November.

The West Indian Molluscs.—After a thorough investigation of these molluscs, Mr. C. T. Simpson has come to the conclusion that the existing fauna is very old, dating back to Eocene times, and has attained its development at its present habitat, in exchange with the continent, but without migration from distant regions.

In the Eocene Period the islands were joined together into large land masses, and a connection existed with Central America through Jamaica, and probably through Yucatan, and perhaps also with Florida. The northern Lesser Antilles were either not in existence at that time, or were subsequently submerged, as no trace of the oldest fauna is found in them. In the Miocene Period a submergence took place, the sea rising, as shown by fossil deposits in Cuba, 1200 feet above its present level. Jamaica was first isolated, and then Cuba, Haiti and Puerto Rico remaining united for a longer time. Then an elevation of the land commenced, which has continued down to the present day.

A rich vegetation sprang up on the deposited limestone, and a new fauna was developed, which on the rain-furrowed slopes of the hills has attained the remarkable specialisation now observed. The Lesser Antilles were colonised chiefly from South America, except the most northern of the Windward Islands, where forms that have migrated from the Greater Antilles predominate.

These conclusions are in complete harmony with the existing depths. Jamaica, which has the most distinct fauna of all the Greater Antilles, is separated from Haiti by a channel 875 fathoms deep, and from Cuba by the Bartlett Deep, over 3000 fathoms. With Central America it is connected by a bank only 500 fathoms below the surface, on which stand several small islands. Between Haiti and Cuba the depth is only 260 fathoms, and between Cuba and the Bahamas less than 100. But between the Greater and Lesser Antilles lies the Anegada channel, with a depth increasing westwards from 1100 to 2000 fathoms.—*Globus*, Bd. lxviii. No. 6.

AUSTRALASIA.

The Physical Geography of Australia.—At the Anniversary Meeting of the Royal Geographical Society of Australia, Brisbane, on July 22nd, Mr. J. P. Thomson, F.R.G.S., President of the Branch, chose for the subject of his address the Physical Geography of the Continent. He briefly sketched its geological history, describing the forms of the land in early geological periods. These may be studied in the maps accompanying Professor Geikie's article, *The Evolution of Climate*, in vol. vi. p. 57, to which the speaker referred. He then dealt with the mountains, pointing out that it possesses no mountains of remarkable elevation, the Coast or Great Dividing range rising only to an average of 4000 feet above sea-level. One of the parts of the continent of which comparatively little is heard is

the Northern Territory of South Australia. The Hon. A. C. Gregory, who has explored this region, describes it as a comparatively high and continuous tableland, very broken and extremely rugged, rising abruptly from the low-lying northern coast lands, and extending southerly to Central Australia. Captain Carrington's report is in accord with this description. It is strange, therefore, that the late Rev. J. E. Tenison-Woods should have maintained that there was no continuous tableland, but only small elevated flats 120 to 300 feet high. Mr. Thomson believed that he never penetrated farther into the interior than the broken edge of the plateau. This Northern Territory offers great inducements to agriculturists. The average rainfall is over five feet; the soil in the river valleys is remarkably rich and fertile, and immense plains, now carpeted with luxuriant grasses, would support other forms of vegetation. This description applies especially to the country drained by the Victoria and Fitzmaurice rivers and Stuart creek, having an area of about 100,000 square miles. Another promising tract is the Nullabor Plains at the head of the Australian Bight. They extend for about 250 miles from east to west, their northern limit being unknown. They are now clothed with rich grass.

Mr. Thomson gave also some interesting figures concerning the Murray river. The statement that from Walgett on the Darling to the sea there was a navigable watercourse of 2345 miles, afforded, he said, no adequate conception of the advantages that the great stream, including its tributaries, offered as a commercial highway, and the immense value of its water supply for irrigation could not be overestimated. The shallow entrance to the river and the comparatively insignificant volume of water which passed through its channel in the dry season were, however, enormous obstacles to navigation, but the lecturer looked forward to the time when, the commercial and industrial resources of the country being more developed, these difficulties would be overcome, and the Murray river would rank among the first of the navigable highways of the world. The total drainage area of the river, as lately determined by Mr. H. G. M'Kinney, is 414,253 square miles, or about one-seventh of the area of the whole continent. The whole basin consists of two parts—a contributing area of 159,889 square miles, with a mean annual rainfall of 25·03 inches, and a non-contributing area of 254,364 square miles, over which the annual rainfall does not exceed 17·15 inches. The mean rainfall over the whole area is 20·19 inches. The mean discharge of the river Darling at Bourke is about 6557 cubic feet per second, and the approximate average depth for a period of twelve years was 10 feet. The mean discharge of the Murray is 2791 cubic feet at Euston, 6336 at Modina (?), and 3516 at Albury, the mean depth at these places being 15·6, 16·1, and 12·1 feet respectively. At Albury the discharge rarely falls below 1000 feet even in the driest seasons. Another stream to which Mr. Thomson drew particular attention is the Victoria, already referred to. It drains a luxuriant country 90,000 square miles in area, and is navigable by vessels drawing 10 to 12 feet of water for a distance of more than 90 miles from the sea.

Mr. Thomson had also much to say on the lakes, climate, etc., of the continent, and to his paper in the *Proceedings and Transactions of the Queensland Branch*, vol. x., are appended schedules of the principal rivers and mountains.

New Zealand.—*The Report of the Department of Lands and Surveys* contains, as in former years, several narratives of exploration. In one of these, Hauturu, or Little Barrier Island, north of Auckland, which has been bought from the natives for a preserve for the fauna and flora of the country, is described. It is forty-five miles from Auckland and about fifteen from Kawau island, where Sir George Grey lived for many years; its area is about 6900 acres. The island is an upheaval of sandstone schist, several of the peaks rising to a height of between 2000 and 3000

feet, very steep and clothed with timber of various kinds to their summits. On the south-east, east, and north to north-west the land rises very precipitously from the sea and is very rough and broken. All the spurs are conglomerate and cemented, and show signs of glacial action. The island is of no use except as a bird preserve, as the only portion that would support crops is a small area of flat land, about 200 or 300 acres in extent. At one time it was evidently peopled, but of late years the natives have only resorted thither to collect Kauri gum.

On April 4th Mr. Walter H. Dunnage started to make the ascent of Ruapehu. The lake, which at Easter in the previous year had been of a beautiful green, was then of a milky colour, and its surface was 10 or 12 feet lower than usual. The temperature of the water was 128° F. The margin was covered with blocks of very friable scoria, among which were innumerable small boiling springs. On the descent of the mountain steam was clearly seen to rise from a slip not much below the western peak. It has been often discussed whether Ruapehu is still active, but, on the 10th of March 1895, all doubt was set at rest by the rise of a column of steam to a height of at least 1000 feet above the crater. Undoubtedly on that, and on several succeeding days, the crateral lake was a caldron of boiling water.

There are also reports on passes over the Southern Alps into the Canterbury District, and a description of the Patea river, with numerous and beautiful illustrations.

POLAR AND GENERAL.

Herr Ekroll in Spitzbergen.—This explorer returned to Hammerfest on September 8th, from which place he sent a telegraphic despatch to the Christiania *Morgenblatt*. In the autumn of 1894 he entered the Storfiord in the *Willem Barents*, and, having built a house on the Anderson islands, sailed up to Whales Point. There was then little ice on the east side, and even till late in September there was none but what was formed in the fiord itself. On October 17th, Herr Ekroll was able to cross the ice to the land, which filled up the channels between the islands, but in the Storfiord itself there were always open channels, and towards the east there was generally an open belt running north and south. The cold was sometimes very severe, the thermometer falling on several occasions to −40° F.; at other times the lowest temperature was −22° to −33°. The precipitation was insignificant, and fell almost entirely in the spring. The wind was generally from the north-east. The most uncomfortable feature was the extreme dryness of the air during the winter. Another peculiarity was a strange indisposition experienced when the wind was south-easterly and the thermometer rising. The symptoms resembled those of malaria; the eyes became bloodshot and very sensitive to light.

From marks on the islands in the Storfiord it is evident that the ice-drift moves almost entirely outwards, whereas the current flows towards the land; hence the ice must be affected more by the north-east wind than by the current. Several indications prove that the ice which approaches the east coast of Novaia Zemlia also arrives at the south-east coast of Spitzbergen. The glaciers, especially on the east, seem to be receding. On leaving its winter quarters in July of this year the *Willem Barents* sailed to the Anderson islands, which were still to some extent enclosed in ice. When it sailed for home the Storfiord was blocked with ice from Whales Point. At the South Cape there was a passage along the west coast.—*Globus*, Bd. lxviii. No. 77.

Meteorological Observations in the Antarctic.—In *Petermanns Mitt.*, Bd. xli. No. 10, Dr. Supan treats of the observations taken on the *Antarctic* during the

months of December 1894 and January 1895. Beyond the 60th parallel the air temperature ranged from 27° to 43° F. The extremes recorded by Ross in the same seas, in the first three months of 1841, were 41·5° and 11·7°, and from Ross's records Hann has assigned to the zone 60° to 68° S. lat. a mean summer temperature of 31·4°, and to the zone 75° to 78° a mean of 24°. From the log-book of the *Antarctic* it appears that these values are decidedly below the normal. For the latitude of 66°, on which the *Antarctic* sailed from December 15th to January 5th, a fairly complete daily curve can be drawn, showing that the daily mean was 32° F. with a range of 2·2°. From January 15th to the 26th the vessel was between lat. 70° and 74°, and the mean was 31·6° with a range from 33·7° to 30·4°. Ross's maximum and minimum were 40·5° and 26·4°. As the year 1841 belonged to a cold period, the normal summer mean probably lies between those of Ross and Kristensen.

The series of water temperatures follows a very regular course. In the northern belt the midday temperature gradually fell from 48° in lat. 54° 33′ S. to 38° in lat. 61° 11′ S. At lat. 63° the temperatures are below freezing point, and range from 30° to 28°. Within the pack ice, between lat. 66° and 68°, there was a constant temperature of 28°. Beyond lat. 70° the open water had a constant temperature of 29°. Ross found the mean for the same season and in the same latitude to be 29·1°.

The barometer readings require correction. The observed maximum in the Polar zone was 29·3 inches, and the minimum 28·1. The permanent low pressure in high southern latitudes was therefore confirmed by this expedition.

As regards the winds, the change which took place from December to January is noteworthy. The western and Equatorial winds gave place to easterly and Polar, and the strength was considerably increased. In January anticyclones seem to have been frequently formed towards the south-east. As a rule southern and easterly winds brought clear weather. In December there were eight bright days and as many partly bright. In January the number of bright days rose to thirteen, and five were in part clear. Rain was observed for the last time in lat. 63°, on December 5th; after that the precipitation took a solid form. There was snow on four days in December and on twelve in January.

Exchange of Air between the Two Hemispheres.—Investigations of Herr Kleiber and General von Tillo have shown that in each hemisphere the atmospheric pressure reduced to sea-level is greater in winter than in summer. The conclusion that an exchange of air must accordingly take place between the hemispheres has been combated by Angot and Hann, on the ground that for the purpose of this inquiry the actual mass of air must be taken, and not the reduced pressure. In Professor Penck's *Geographische Abhandlungen*, 1891, Dr. Franz Heiderich has arrived at a result, from which it appears that in the northern hemisphere the same pressure prevails in January and July. In the southern hemisphere there is, indeed, a higher pressure in July, but this is explained by the fact that the Polar *calotte* from 50° to 90° is omitted from the calculation; it is probable that the difference in the southern hemisphere, as in the northern, is compensated for in higher latitudes. It is singular that Heiderich should have arrived at a conclusion so opposed to that of his predecessors, but still more so that the differences he obtains between the January and July pressures are not changed by reduction to a higher level. This error, Dr. O. Baschin states in the *Zeitschrift der Gesells. für Erdkunde zu Berlin*, Bd. xxx. No. 4, is due to the difference of temperature between January and July being neglected in the reduction of the pressure to the mean height of the zone. Dr. Baschin has himself compiled a table of pressures, from which it appears that the difference in the northern hemisphere between

winter and summer is not the ·3 mm. found by Heiderich, which lies within the limits of probable error, but 1·3 mm. At first sight a difference of 1 mm. seems small, but it corresponds for the whole hemisphere to a mass of more than 490,000 million tons of air. To settle the question finally smaller elements of area must be taken—say five-degree squares instead of ten.

MISCELLANEOUS.

The *Faraday* is shortly to leave this country for Para, from which town a cable is to be laid along the **Amazons** for a distance of 1100 miles, as far as the mouth of the Rio Negro at Manaos.

The second **Italian Geographical Congress** was held in the University buildings, Rome, from the 22nd to the 27th of September. A record of the proceedings is published in the *Boll. della Soc. Geogr. Italiana*, vol. viii. Fasc. 10.

On June 23rd a German expedition, under A. Humpelmayr and Lieutenant Sperhinger, left Berbera for the interior of **Somaliland**. They intend to make for Mombasa.—*Verh. der Gesell. für Erdkunde zu Berlin*, Bd. xxii. No. 7.

In the months of August and September Dr. Th. Thoroddsen explored the north-eastern corner of **Iceland**, the peninsulas of Melrakkasletta and Langanes, with the adjoining plateaus. On the Melrakkasletta peninsula he discovered a line of craters hitherto unknown, and several lakes which do not appear on maps.—*Petermanns Mitt.*, Bd. xli. No. 10.

The greatest depth yet sounded has been found by H.M.S. *Penguin*, under Commander Balfour, in the **Pacific Ocean**. The exact depth is not known, for at 4900 fathoms the wire rope broke. The spot lies in 23° 40′ S. lat. and 175° 10′ W. long., about 60 miles north of a depth of 4428 fathoms sounded by Captain Aldrich in 1888. The greatest depth hitherto discovered lies near Japan (see vol. viii. p. 267), and measures 4655 fathoms.—*Globus*, Bd. lxviii. No. 77.

The Danish cruiser *Ingolf* returned from the seas of **Iceland and Greenland** in September. It was sent out for hydrographic research, particularly the investigation of the deep-sea fauna. Ice and fog were great hindrances to the expedition, but the result is very satisfactory. Many hitherto unknown forms have been discovered. It is intended to send out two expeditions next year, the one to Icelandic waters, the other to the West Indies.—*Deutsche Rundschau*, Bd. xviii. Heft 2.

Professor C. Dufour describes, in the *Archives de Genève*, elevations in the form of truncated cones which are found on the surface of the ice on the Lake of Neuchâtel, between Grandson and Yverdun. They attain a height of as much as $6\frac{1}{2}$ feet, and their summits contain craters from which a man would find it hard to get out unaided. These formations have been noticed in northern countries, and in the severe winter of 1788-89 were observed by De Luc on the Lake of Geneva.—*Boll. della Soc. Geogr. Italiana*, vol. viii. Fasc. 11.

We regret to record the death of **Herr Oscar Borchert**, which took place on November 13th at Ludwigslust. He was second in command in Dr. Carl Peters' expedition up the Tana, and accompanied his leader to Edinburgh in February 1891, when the latter delivered an address to the Society. Herr Borchert's last work was to command the expedition appointed to place the steamer *Wissmann* on the Victoria Nyanza. Before reaching the lake he was taken so ill that he had to resign the command to Count von Schweinitz.

The gunboat *La Grandière* has steamed up the Mekong to Luang-Prabang, proving that the river is navigable for a distance of 1500 miles. Lieut. Simon, who was in command and made the passage from Stung-Treng to Luang-Prabang, a distance of more than 900 miles, reports that as far as Vien-Chan the river may be rendered navigable throughout the year at a small cost. From Vien-Chan to Luang-Prabang there are 220 miles of rapids, falls, and obstructions, impassable at low water, but at high water the passage may be made in ten days.—*Revue Française et Exploration*, October.

NEW BOOKS.

The Cities and Bishopries of Phrygia, being an Essay of the Local History of Phrygia from the Earliest Times to the Turkish Conquest. By W. M. Ramsay, D.C.L., LL.D., Professor of Humanity, Aberdeen, etc., etc. Vol. I.: The Lycos Valley and South-Western Phrygia. Oxford: at the Clarendon Press, 1895.

This is a masterly work, and will tend at once to confirm and to enhance the high reputation which the author has already established for himself as an investigator of the antiquities of Asia Minor. His preface reveals to us with what ardour he engaged in the work of exploration—with what pains he collected and sifted his materials—and with what circumspect care he reached his conclusions. He tells us that before he entered Asia Minor in 1880 he had been pondering for months over the problems of its history—that since that time a space of five hours had rarely elapsed by day or by night in which some part of Phrygian antiquities or topography had not been occupying his mind—that he had turned over each problem—attempted almost every possible combination, and that gradually month by month the subject had grown clearer. He had, moreover, revisited the country year after year till 1891, and while making his excursions it was ever his passion to look for traces of the past in the facts of the present—in the faces, manners, pronunciation, tales, and superstitions of the people. He tell us, besides, that in numberless ways he utilised everybody he knew, and he expresses his obligations to those, among others, who travelled with him for the Asia Minor Exploration Fund—to the explorers belonging to the French School of Athens, and to Professor Th. Mommsen, who, he states, often interrupted his own work to answer his questions. From all this it will be seen that his work is one which lies beyond the range of ordinary criticism, and in the remarks which follow we propose to do nothing more than to indicate in what manner he has treated his subject, and to notice a few of the more salient points in Phrygian history which fall within the compass of his present narrative.

As Phrygia was only for a short time, and at a remote period, a unified and independent State, its history lacks unity, and our author found himself in consequence forced to adopt the plan of describing separately the fortunes of each district. The descriptions overtaken in this volume embrace the valley of the river Lycos, an affluent of the Maeander, and the various districts which make up the south-western portion of Phrygia. These descriptions, into which all manner of facts enter which can throw light on the past of the districts to which they refer, are distributed among nine chapters, each followed by two or more appendices, of which the first deals with the inscriptions found on the local monuments and coins, while another furnishes lists of such names as have been preserved of the bishops

who successively ruled in each district. The most interesting chapters are those which respectively describe the Lycos valley, Laodiceia, Hierapolis, Colossai, and Cibyra. They throw great light on such subjects as the ethnology of Phrygia, the identification of its old sites, the nature of its primitive religion, the social habits of its people, the changes introduced by the foreign races to which it successively became subject, the nature of the local self-government permitted under the Imperial rule, and the early history of Christianity in the country.

The extent and boundaries of Phrygia varied very much at different periods of its history. In the earliest times it seems to have been part of that great empire which was subject to the sovereigns of Pteria—a great city in the north of Cappadocia, which has lain in ruins since 539 B.C. At the time of the Persian dominion, Phrygia was limited to its two divisions, known as Lesser and Greater Phrygia, the former stretching along the Propontis and the Hellespont to Troas, and the latter occupying the central portion of Asia Minor. Under the Roman dominion Greater Phrygia was in the fourth century of our era divided into *Phrygia Salutaris*, which comprised the eastern part, with Synnada for its capital, and *Pacatiana*, which comprised the western part down to the frontier of Caria. Justinian again, in 535, divided the country into three Themata—Anatolian, Opsician, and Thrakesian.

Nothing is known regarding the race by which Phrygia was first peopled, except that it was subject, as we have said, to Pteria. Its remaining monuments are but few, and the inscriptions on these are in a tongue as yet unknown. The Phrygians, it has now been ascertained, were a tribe of conquerors who crossed the Hellespont from Macedonia and Thrace and gradually penetrated into Asia Minor. These immigrant Europeans were mail-clad warriors, sprung of a race that had been accustomed to use metal for defensive purposes, and as their armour gave them great advantage over their opponents, who were armed in the slighter Oriental fashion, they fought but to conquer. As these immigrants brought with them few women of their own race, they took to themselves wives from the subject caste and the older inhabitants, and in the course of time losing their warlike proclivities, settled down into the general type of the Anatolian population. Their independence was first forfeited to the Cimmerians, who occupied Phrygia from 610 to 590 B.C.; then in succession they became subject to the Persians, the Macedonians, the Seleucid Kings of Syria, the Pergamenian Kings, the Romans of the Republic and the Empire, the Byzantine Emperors, the Seljuk Sultans of Iconium, and finally to the Ottoman Turks, whose baleful domination in Anatolia dates from the year 1306 A.D. Under all her rulers except the last, Phrygia was on the whole fairly well governed, and enjoyed a moderate share of prosperity, marred, however, at times after the power of the Byzantine Emperors had begun to wane, by plundering incursions of fierce nomadic Turkish hordes. The Ottoman rule has proved as deleterious to Phrygia as to every other country held under its grasp. The Osmanli conquest, our author observes, was so thorough, because it destroyed the civilisation of Asia, and its thoroughness was proportionate to its destroying effect. Where it suffered any commerce and education to remain it was correspondingly less effectual.

The Phrygian religious cult was a form of Nature worship, wherein the chief divinity was of the female sex—Mother Cybele, or Mother Leto, whose priests, like Atys who first held the office, were mutilated. The sacred city of this cult was Hierapolis, situated at a distance of six miles from Laodiceia, and in a locality where the power of Nature was more strikingly revealed than in any other place known to the ancients. The worship of the goddess, like that of Bacchus, was remarkable for the wild enthusiasm to which its votaries abandoned themselves.

It was characterised, says our author, by a mixture of obscene symbolism and sublime truth ; by negation of the moral distinctions and family ties that exist in a more developed society, but do not exist in the free life of Nature. The key, however, which explains all its repulsive legends and ceremonies is, he adds, the mystery of self-reproduction—of eternal unity amid temporary diversity. There is only one other subject to which the space at our command will permit us to refer. Professor Ramsay has, we consider, done a very useful service in ascertaining what were the names and seats of the Bishoprics which existed in the various districts which he has described. He has thus set an example which it would be well for writers of works of a kindred nature to follow ; for, were this to be done, it might in course of time become possible to have lists compiled, more or less complete, of the ecclesiastical territorial divisions of the whole Christian world. The publication of the volumes which are to complete this great work will be eagerly expected in all circles of learning.

The Valley of Kashmir. By Walter R. Lawrence, I.C.S., C.I.E., Settlement Commissioner, Kashmir and Jammu State. With Illustrations. London : Henry Frowde, Oxford University Press Warehouse, 1895.

This volume is the most scholarly and comprehensive work on the interesting country of Kashmir that has yet appeared, and contains at the same time a record of the recent land revenue settlement of the valley. Hitherto the only authorities on Kashmir have been Vigne and Drew. But Vigne was merely a traveller with great powers of observation, and without the peculiar experience and the many sources of information possessed by Mr. Lawrence, and Drew tells little about the people, the lives they lead, or the way they are governed. The valley of Kashmir had for years been misgoverned and neglected, and the people had been groaning under a cruel and inelastic system of revenue administration, while, in spite of the good intention of their rulers, they were being oppressed and crushed by a rapacious and unsympathetic official class. To remedy this state of things a reorganisation of the land revenue system of the country was begun in 1887. Mr. Lawrence had charge almost from the beginning, and brought the work to a close in the early part of 1895. The operations consisted of a careful re-survey of the land, an examination into and a recording of the rights of the agriculturists in the land, and a readjustment of the State demand in the shape of land revenue, which also included the heavy and delicate task of apportioning to each individual his proper share of the burden. Naturally time alone will show what the full result of these operations will be ; but it is clear from indirect evidence supplied in the book itself, that they were based on very wise and sound principles, and were carried out with an ability, energy, and sympathy which are remarkable even in a service with such high traditions as that to which the author belongs.

It is perhaps unfortunate, from the scientific geographer's point of view, that more should not have been said about the actual work of survey and settlement ; but that is contained in ample detail in the various reports, previously submitted to the State, which deal exclusively with assessment matters. The present work is of more general interest. Separate chapters treat of the physical geography of the country, the flora and fauna, archæology, political and physical history, social and religious life, agriculture, trade, and so on. Wherever the help of a specialist was necessary he has been consulted—as, for instance, in the case of geology or botany. Mr. Lawrence, like most other officials in India, has had to write the book under the constant pressure of other heavy work, but there is no trace of this in its pages. This report is one of the most able and

interesting of its kind, and will be as welcome to every student of geography and etymology as to the general public. The volume has been published from the Oxford University Press in a becoming form, and is well illustrated.

Reise nach Süd-Indien. Von Emil Schmidt, mit 39 Abbildungen im Text. Leipzig: Verlag W. Engelmann, 1894. Pp. 314.

The purpose of Herr Schmidt's visit to the Madras Presidency seems to have been to obtain anthropological measurements of the wilder hill tribes still found there, and, generally speaking, to study the characteristics of the different races and classes of people that inhabit the south of India. The measurements are probably reserved for an anthropological journal, but he gives a good many interesting facts about the uncivilised hill peoples. In some instances he could note a gradual amelioration of condition and a slight rise in the scale of civilisation compared with a century or so ago. For instance, the Kanikars of the Tinnevelli district no longer abandon a whole village when a death takes place and form a new settlement at a distance from the old one; nor do they build their straw huts in trees to be out of the reach of tigers and wild elephants, as they did at a very recent date. Like many other degraded races their muscular system is weak, and, curiously enough for a jungle people, they seem to be very poor shots with a bow and arrow. Almost their only industry is basket-making, at which they are proficient. Other necessaries, such as knives, arrow-heads, pottery, and woven stuffs are obtained from Mohammedan pedlars. At Cochin, on the west coast, the black Jews are so despised by their white co-religionists that regular marriages never take place between them. Yet concubinage between white males and black Jewesses is far from uncommon, with the result that every gradation of colour from the lightest to the darkest is to be found among the Hebrew population. The Malsers of the Anämalä Hills—a short, slight built, brown, forest people—are not, as we might imagine, hunters, but live on roots, chance carcases, and fish, which they catch in their hands, as they have no nets. They always marry within the village. About a hundred years ago they used to burn their dead, but now this is only done with old people, and the young are buried with the head to the south.

When a Badaga of the Eastern Nilgiri Hills is on the point of death a small piece of money is placed in the dying man's mouth. He ought to swallow it if possible, but if too weak to do so it is wrapt up in a piece of cloth and tied to his arm. When dead his body is laid on a pile of wood with his ornaments and implements. Next morning, a dance, lasting till midday, is performed by men in front of the pile; the sins of the deceased are then transferred to a calf and the pyre is ignited. On the following day the ashes are thrown into a stream, and the larger bones are covered with large stones.

Compared with English missionary labours the Basle missionaries make fewer converts, which the author explains by the much greater strictness of the latter, and their aiming at quality rather than quantity. He was shocked at seeing a native convert tie a string to a bumble bee's leg, attach the string to a stick, and wave it about in church to the amusement not only of the congregation but of the native clergyman.

Die Regentschaft Tunis. Streifzüge und Studien. Von Rudolf Fitzner. Berlin: Allgemeiner Verein für Deutsche Litteratur. Pp. x + 360.

This is not the work of a passing tourist; the author spent some four years in the Regency, and was familiar with the language. He seems personally acquainted

chiefly with the northern and east coast districts, and discourses pleasantly on the charms of the scenery and climate, giving us, besides, a clear account of the modes of travelling and of the life and ways of the people, both in the wilder parts and in the coast towns, the latter, most of them, now containing a certain European element. Much of the description of Eastern life will be familiar to English readers ; and those acquainted with India at all events will consider his statement of the absolute irreconcilableness of the Moslem under Christian rule to be practically much exaggerated. These, however, are isolated defects, and the book appears to be the result of careful observation in many directions. The only fault we have to find is the absence of a map ; for the slight ethnological sketch-map, though both interesting and valuable, and the fruit, doubtless, of much observation and study, is of little use beyond its own special purpose. This want diminishes considerably the interest of the detailed geological and other physical descriptions, which are given in much detail, not merely of the parts he has himself visited, but of the whole territory. The fauna and the flora, natural as well as cultivated, are also adequately treated. The writer confidently predicts that as a result of law and order introduced by the French, the productive powers of the region, one of the chief granaries of Rome, will be immensely developed. At present one of the most important industries is the harvesting of the Halfa grass, *Stipa tenacissima*, of which many shiploads are yearly brought over to the Scottish paper-mills.

The olive and oil trade is also very important, as are the fisheries and sponges along the coast, and towns like Sfax and Sus are centres depending both on their agricultural and their marine industries. Roman remains, which one might expect to abound in the old provinces of Byzacium and Zeugitana, are chiefly found in the remoter parts ; in the more thickly-peopled districts the old buildings have gone to build the modern towns. In fact, the sacred Kairouan is one of the very few towns with no such origin, and founded by the Arabs.

In an interesting sketch of the history of the country the writer gives reason for believing that the original Berber race received very little infusion of foreign blood from any of the earlier invaders, Phœnician, Roman, or Vandal, and was not essentially "arabisirt" till after the great invasion by the Weled Hilal in the eleventh century. Still, as he himself allows, not only is the Berber type found remarkably distinct in their various isolated mountain settlements, but the curious democratic system of government in force in the great Urgámma tribe, of which Herr Fitzner gives an interesting account, implies a very different set of ideas from those of the Arab. The Berbers may also be looked on as essentially a cultivating, as opposed to a nomad pastoral, race ; though, under certain circumstances, it suits them to wander with their flocks during a certain season of the year. But the race to which the author seems to attribute the greatest natural gifts is that now known as the Moors, descended, as he believes, from an early Semitic graft on the original Berber stock, and refined later on by other elements, such as Spanish immigrants and European slaves. In this case he perhaps underestimates the proportion of a Vandal element. But we have said enough to show the numerous matters intelligently treated in the volume.

South Africa: A Study in Colonial Administration and Development. By W. Basil Worsfold, M.A. London : Methuen and Co., 1895. Pp. 266. *Price* 6*s.*

Mr. Worsfold's *South Africa* is a well-informed, well-conceived, and well-written account of the past history and the present condition of the African States and Colonies south of the Zambezi. In the preparation of the work, which is

thrown into the form of lectures, the author's historical and critical faculty has been aided by information acquired during a residence of nearly two years in Cape Colony and Natal. The most striking points in his treatment of a subject which abounds with complex problems are his ready and firm grasp of salient points, his power of generalisation, and the aptness of his literary allusions and his historical side-lights. His first chapter, which treats of early history and occupation, tells the familiar story of the Portuguese and Dutch Settlements in a fresh and interesting way. It opens with an instructive comparison and contrast of the leading characteristics of South Africa with those of Australasia, Canada, and India, the author's object being to show how the history of South Africa is made specially interesting by the peculiarity of its political, social, and physical characteristics. The second chapter is devoted to the Kafir wars ; the third to Sir Bartle Frere's policy of Federation ; and the fourth to the Boers, including the Transvaal revolt. A very important chapter deals with the Bechuana Settlement, which the author regards as the turning-point in the British Administration of South Africa. The chapters on the Kimberley diamond mines, and the De Kaap and Johannesburg gold-fields, contain a great amount of valuable information both as to processes and as to results. The section on South African Literature is specially interesting, showing as it does how the works of Rolf Boldrewood, Thomas Pringle, and Olive Schreiner embody not merely the letter, but also the spirit and essence of Colonial life. The closing chapter deals with the Chartered Company, and appreciatively with the policy of Mr. Cecil Rhodes. The appendix contains copious notes, a historical summary, and the full text of the Convention of London, 1884, which is the more valuable that the Blue-Book containing it is now out of print. There is an excellent map of South Africa by Philip, showing the latest railway extensions ; but there is no index, which is a serious defect.

Outre-Mer : Impressions of America. By Paul Bourget. London : T. Fisher Unwin, 1895. Pp. 425.

Not a few of the European visitors to the World's Fair, who spent some weeks in the States, have thought themselves competent to present the public with a comprehensive view of American civilisation, and to pass a final verdict on it. Not so M. Paul Bourget, who too visited America on the occasion of the Chicago Exposition. He stayed some eight months in the country, but he confined himself to the eastern half, not going farther west than St. Paul and Minneapolis, and he only professes to study a few aspects of American life in order to grasp them thoroughly. Democracy, Science, and Race in the States are the problems that occupy him above all, and *Outre-Mer* is the outcome of his observations and reflexions. Being one of the most distinguished French writers of the present day, and enjoying special facilities for gaining an insight into American life, he has produced a book which is both most enjoyable and highly instructive to read. He introduces us to Society at Newport, where he notices the absence of moderation in luxury, coupled with an earnest desire to assimilate European culture. He is struck by the position of women, who form the centre of society in the States, and this leads him to make Women and Girls the subject of a most interesting comparative study. In Business Men he admires the strong individuality and personal initiative. This he also finds in the educational system of the country, which is so different from the centralised organisation of France. American Pleasures look to him very much like hard work : "Unlike the Latin, who amuses himself by relaxation, he amuses himself by intensity." The lower orders, of course, receive their due share of attention. He visits them in their homes, and reports

the interviews he had with the two most prominent Roman Catholic dignitaries on the American workmen. A visit to Georgia and Florida and a general summary of his impressions closes the book. *Outre-Mer* displays a spirit of large-minded impartiality; its author is by no means blind to the shortcomings of American culture, but he is ever ready to recognise what is superior in it to that of his own country. Matter as well as style make it one of the most attractive books on America, which is sure to win favour also in this country, and we ought to be grateful to Mr. Fisher Unwin for having published an excellent English translation.

A Scheme for Imperial Federation. A Senate for the Empire. By GRANVILLE C. CUNINGHAM, of Montreal, Canada. With an Introduction by Sir FREDERICK YOUNG, K.C.M.G. London: Longmans, Green, and Co., 1895. Pp. xii+116. *Price* 3*s.* 6*d.*

In this volume three articles published in 1879 in the *Westminster Review* are collected. Since that date the question of federation has been much discussed, and the arguments in favour of it have been frequently repeated; but they cannot be too strongly impressed on the inhabitants of Great Britain and of the Colonies, and therefore this small volume may do useful service. The scheme in the third chapter, of a system of representation, is open to criticism; that, however, is to be expected in a first sketch, and no doubt the author only desired to lead the way.

Collected Papers on some Controverted Questions of Geology. By JOSEPH PRESTWICH, D.C.L., F.R.S. London: Macmillan and Co., 1895. Pp. 279.

In these pages the Nestor of British geologists gives the views he has finally adopted upon questions which have been debated for many years. Although the six articles which compose the volume appeared in the Proceedings of learned societies, yet each article has been revised by the author. The volume has a wide scope, embracing as it does articles on (1) Uniformitarianism; (2) the Glacial Period, with reference to the Antiquity of Man; (3) the Flint Implements of the Chalk Plateau of Kent; (4) the Agency of Water in Volcanic Eruptions; (5) the Thickness and Mobility of the Earth's Crust; and (6) Underground Temperatures. In every article the author shows not merely ripe knowledge and most painstaking research, but independence of judgment and determination to accept no opinion but that which thoroughly recommends itself to him. Thus, the halo of authority which surrounds the Uniformitarian School of Geology does not prevent the author from warning his readers against "the *fetich* of uniformity," which, he says, "hesitated not, at first, to claim for Man an antiquity of nearly a million years. One friend of ours, in a public lecture, even put in a claim for two millions, heedless of the cries of his unprepared audience reminding him of the rights of Adam." At the same time, the author admits in a footnote that "it is possible that the antiquity of Man will have to be carried back further into the Glacial Period," so that "the rights of Adam" must really be relegated to a remote antiquity; for the author states that, according to Dr. Croll's latest theory, the "date now very generally accepted" for the commencement of the period of eccentricity to which the Glacial epoch must be referred was "240,000 years ago." In the second article the author gives his opinion more precisely as to the limits of "the epoch of extreme cold" called the Glacial epoch, and the date of Palæolithic Man. He thinks the Glacial epoch may "come within the limits of from 20,000 to 25,000 years," and that it was followed by the so-called Postglacial Period, or melting away of the ice-sheets, which extended over some 8000 to 10,000 years. In any case, he believes

that "Palæolithic Man came down to within 10,000 to 12,000 years of our own time." He considers, however, that if Palæolithic Man was of early Glacial age, his antiquity "was no greater than perhaps about from 38,000 to 47,000 years," whereas, if he was only of Postglacial age, his antiquity would be "from 18,000 to 27,000 years before the time of Neolithic Man in Europe." It is evident, therefore, that the author is willing to accord Man a very great antiquity indeed. We regret that so valuable a book, and one so likely to be consulted as a work of reference, has no index.

British Rainfall, 1894. *On the Distribution of Rain over the British Isles during the year* 1894. Compiled by G. J. Symons, F.R.S., etc., and H. Sowerby Wallis, F.R.Meteor.Soc., etc. London: Edward Stanford, 1895. Pp. 44+254. *Price* 10*s*.

In this volume, the fifth of the series, are recorded more than 3000 perfect records of observations in all parts of the Kingdom. In 1860 the number of observers was only 168. The year 1894 was remarkable for its large rainfall, particularly in Kent, Sussex, and the Isle of Wight, where it was more than 30 per cent. above the average. Mr. Symons stated in February of last year that the years ending with 4 had always less than the average rainfall, but that every twelfth year from 1860 had been wet, whether it ended in 4 or not. This rule was certainly broken in 1894, but for the first time since 1812. Mr. Symons, therefore, looks forward with some interest to the year 1896, when the second part of the rule will again be tested. It is not necessary to say more of this valuable record, as Mr. Symons' annual volumes are well known.

The History of Mankind. By F. Ratzel. Part I. London and New York: Macmillan and Co.

This is the first part of a translation of Ratzel's well-known *Völkerkunde*. We shall be better able to judge of the work of the translator when more numbers have been issued.

Handbuch der Shambala-Sprache in Usambara, Deutsch-Ostafrika. Mit Texten, einem Shambala-Deutschen, und einem Deutsch-Shambala-Wörterbuch. Von A. Seidel, Sekretar der Deutschen Kolonialgesellschaft. Dresden, Leipzig: Verlag von Alexander Köhler, 1895. Pp. 135.

The author of this brochure is well known for the philological work he has done in connection with African dialects. This handbook is valuable, not only for its thorough investigation of the grammar of the language spoken in Usambara, but also for the various fairy tales which it contains. The vocabulary is very full, and will prove very useful to residents in East Africa.

Gazetteer of the Gujranwala District. Revised Edition. 1893-94. Compiled and Published under the Authority of the Punjab Government. Lahore: *Civil and Military Gazette* Press, 1895. Pp. xliv+187.

This second edition of the *Gujranwala District*, in consequence of the careful revision to which the work has been subjected, and the incorporation of much new matter, including the most recent available statistics, is now a very complete and useful store of valuable information. The physical features and character of the district, the history of the people, the productions and the local administration, are

all dealt with in full detail. Under each head there is much that will be found to have special interest for all who are desirous of having an intimate acquaintance with the inner economy of an Indian district, as it certainly will be indispensable to those engaged in the administration. A map of the district is also furnished, which, if it do not exhibit many particulars, contributes greatly to the usefulness of the volume.

Switzerland and the Adjacent Portions of Italy, Savoy, and Tyrol. Handbook for Travellers, by KARL BAEDEKER. Pp. xxx + 500.

The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers, by KARL BAEDEKER. Pp. xxiv + 518. Leipzig: Karl Baedeker; London: Dulau and Co., 1895.

Baedeker's *Handbooks* have acquired a world-wide celebrity for accuracy and general usefulness, and the fact that those of which the titles are given above are the sixteenth and eighth edition respectively, shows that they have been appreciated by British tourists. It need hardly be mentioned that they have been brought up to date. The maps and plans are of the usual excellence, and have been increased in number.

Norway, Sweden, and Denmark: Handbook for Travellers. By K. BAEDEKER. Sixth Edition. Leipzig: Karl Baedeker, 1895. Pp. 410. *Price* 10 *marks.*

Baedeker's Guides are usually carefully revised, but in some details this one admits of correction and improvement. For instance, the tourist will look in vain for Kiel either at p. 334, as stated in the index, or at p. 354, as stated at p. 364. Nor will he find the English church of St. Albans at "Pl. F 3, 4" in the plan of Copenhagen, as stated at p. 345. Inaccuracies such as these worry the tourist, and ought not to occur in a well-edited Guide. Again, whilst detailing the indirect route from Copenhagen to Hamburg by the Danish Islands and Slesvig, this handbook does not devote so much attention to the two great direct routes from Scandinavia to the south, viz. (1) *viâ* Korsör and Kiel; and (2) *viâ* Gjedser and Warnemünde. One may ask, also, why no asterisk has been prefixed to the admittedly leading hotel of Copenhagen, which is further damaged by the affix "high charges," when its charges are not higher than those of other first-class hotels. An asterisk also seems wanting before Thorvaldsen's "Venus with the apple of Paris," at p. 351. Criticising one of Baedeker's Guides, however, is like finding spots in the sun; and it need scarcely be added that, for comprehensiveness, erudition, and general accuracy the present handbook forms no exception to its predecessors. A useful Norwegian and Swedish grammar, with vocabulary, is appended.

'The Continong': A Guide to France and to French (as she is spoke). By ANAR DE LA GRENOUILLÈRE, F.O.N.S. London: Charles Hirsch, 1895. Pp. xii + 147. *Price* 1s. 6d. *net.*

We have great doubt whether phrase-books are of much use to travellers who know nothing of the language of the country in which they travel. There is, however, much difference between French "as she is spoke" and classical French, and on that account the information in this little book may be of great service. There are also directions for transacting business at the post-office, banks, etc., and a vocabulary of slang—a necessary companion to the comic papers.

NEW MAPS.

WORLD.

OZEANE. Linien gleicher mittlerer Jahresschwankung der Temperatur des Oberflächenwassers der ——. Entworfen von Dr. Gerh. Schott.

Petermanns Mitteilungen, Tafel 10, 1895.

EUROPE.

EUROPE OCCIDENTALE. Carte des Hauteurs de Pluie sur l'——. Moyenne des trente années 1861-1890. Par M. Alfred Angot.

Annales de Géographie, Paris, No. 19.

SCOTLAND. Orographical Map of ——. By John Bartholomew, F.R.G.S. Scale 10 miles to an inch.

The Geographical Institute, Edinburgh.

DIE UNTERE WEICHSEL mit ihrer neuen Mündung bei Schiewenhorst.

Geogr. Rundschau, Wien, Bd. xviii. Heft 2.

SEEN DER ALGÄUER ALPEN. Tiefen einiger ——. Von Dr. Halbfass. Massstab 1 : 25,000.

Petermanns Mitteilungen, Tafel 10, 1895.

AFRICA.

MADAGASCAR. Esquisse Ethnographique et Politique. Par Henri Mager. Échelle 1 : 4,100,000.

Au Siège de l'Association de la Presse Coloniale, Paris.

On this map the territories conquered by the Hovas are coloured in three different shades of red. Probably these shades indicate different degrees of dependence on the Hova Government, but no information is given on the map. The date at which each post was occupied by the French is given.

SESSE-INSEL. Originalkarte einer Forschungsreise auf der ——. Aufgenommen und gezeichnet von Pater Brard, 1893. Massstab 1 : 300,000.

Petermanns Mitteilungen, Tafel 2, 1895.

MADAGASKAR. Massstab 1 : 4,000,000.

Geogr. Rundschau, Bd. xviii. Heft 1.

CONGO. Croquis Politique de l'État Indépendant du ——, donnant la délimitation des quinze districts conformément aux limites fixées par les décrêts du 1er Août 1888, 16 Octobre 1891, et 17 Juillet 1895. Dressé par A. J. Wauters. Échelle de 1 : 10,000,000.

Le Mouvement Géographique, No. 25, 1895.

AMERICA.

CANADA. Map showing the route followed by Mr. J. B. Tyrrell on his second expedition through the Barren Lands of ——. Scale 1 : 4,000,000, or 63 miles to 1 inch.

The Geographical Journal, Nov. 1895.

ANDES. Plano Demostrativo de la Cordillera de los —— y de la Linea Divisoria de Aguas entre las Latitudes 42° y 46° Sud. 1895. Escala 1 : 750,000.

Boletin del Instituto Geogr. Argentino, Tomo xvi. Cuaderno 1.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

REPORT OF COUNCIL.

Eleventh Session, 1894-95.

The Council begs to present the following Report :—

Membership.

The changes in the number of Members have been as follows :—

Number on 31st October 1894,		1417
New Members added,		34
		1451
Deduct by Deaths,	25	
,, Resignations,	76	
Struck off the roll by the Council (subscriptions in arrear),	25	
		126
Number remaining on 31st October 1895,		1325

Of these, 749 are on the Edinburgh list ; 264 on the Glasgow list ; and 80 and 43 on the Dundee and Aberdeen lists respectively ; 189 Members reside in England or Abroad. 190 are Life Members.

Diplomas of Fellowship.

The Council, acting on the recommendation of the Education Committee, has conferred the Ordinary Diploma of Fellowship on the following gentlemen :—D. J. Macaulay, L.R.C.P. ; C. G. Cash ; W. L. Carrie, M.A. ; James Russell Brazier ; and John Smith.

The Society's Honorary Fellowship was conferred on The Hon. Sir Charles Tupper, Bart., G.C.M.G. ; Sir William Renny Watson ; and John Allen Brown, F.R.G.S., F.G.S.

Finance.

The Council submits the annexed Financial Statement.

ABSTRACT OF THE ACCOUNTS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

From 31st October 1894 to 31st October 1895.

FUNDS AT CLOSE OF LAST ACCOUNT :—			
£1000 Glasgow and South-Western Railway 4 per cent. Funded Debt, cost, 29th May 1885,		£1102 19 9	
£400 North British Railway 4 per cent. Consolidated Lien Stock, cost, 30th December 1890,		496 2 0	
£300 New Zealand Government 3½ per cent. Inscribed Stock, cost, 30th May 1894,		305 13 6	
		£1904 15 3	
Cash in Accounts Current with Bank of Scotland at Edinburgh, £12, 14s. 1d., and at Glasgow, £5, 5s.,		17 19 1	
Due by Secretary, £3, 1s. 3d., and by Honorary Treasurer, £15, 5s. 11d.,		18 7 2	
		£1941 1 6	
ENTRANCE FEES—34 at £1, 1s.,	£35 14 0		
ORDINARY SUBSCRIPTIONS :—			
11 Life Members at £10, 10s.,	115 10 0		
2 Annual Subscriptions at £1, 1s. for year 1890-91,	£2 2 0		
4 Do. Do. 1891-92,	4 4 0		
7 Do. Do. 1892-93,	7 7 0		
18 Do. Do. 1893-94,	18 18 0		
1065 Do. Do. 1894-95,	1119 6 0		
24 Do. Do. 1895-96,	25 4 0		
	1177 1 0		
Diploma Qualification Fee—1 at £1 1s.,	1 1 0		
	£1,329 6 0		
FEES received for Society's Diploma—4 £1, 1s.,	4 4 0		
SUMS received under the Society's Scheme for the encouragement of Geographical Education,	1 6 0		
LECTURE TICKETS sold,	12 1 9		
MAGAZINES sold,	52 12 10		
DIVIDENDS and INTERESTS,	66 5 6		
		1465 16 1	
		£3406 17 7	

MAGAZINES, Printing, Paper, Lithographing, etc., from Nos. 9 to 12 of Vol. X., and Nos. 1 to 8 of Vol. XI., all inclusive, and for Postages, etc.,			£768 10 4
Less : Received during the year for Advertising,			60 0 0
			£708 10 4
GENERAL PRINTING,			14 11 0
BOOKS and other Furnishings for Library,			42 13 9
RENTS OF HALLS, and other expenses of Lectures,			164 14 0
RENTS OF COUNCIL ROOM, Taxes, Gas, Repairs, Insurance, etc.,			126 5 6
SALARIES :—			
To *Secretary*, year to 15th October 1894,	£200 0 0		
,, *Librarian and Clerks*,	272 5 0		
			472 5 0
EXPENSES connected with Society's Education Scheme,			12 6 2
MISCELLANEOUS, including Stationery, General Expenses, Advertising, Cleaning, Postages, and Office Furniture,			58 17 7
EXPENSES connected with attending Meetings of Geographical Congress and British Association,			18 10 8
EXPENSES connected with Franklin Commemoration,			28 9 9
			£1647 4 1
FUNDS AT CLOSE OF THIS ACCOUNT :			
£1000 Glasgow and South-Western Railway 4 per cent. Funded Debt, cost, 29th May 1885,		£1102 19 9	
£533, 6s. 8d. North British Railway 3 per cent. Consolidated Lien Stock, cost, 30th Dec. 1890,		496 2 0	
£300 New Zealand Government 3½ per cent. Inscribed Stock, £305, 13s. 6d., *less* proportion of Dividend applicable to Capital £4, 3s. 8d., cost 30th May 1894,		301 9 10	
		£1904 11 7	
Deduct—Balances due to Bank of Scotland on Accounts Current at Edinburgh, £149 12s. 6d., at Glasgow, £5, 12s.,	£155 4 6		
Less—in hands of Honorary Treasurer £7, 16s., and of Secretary, £6, 10s. 5d.,	14 6 5		
		140 18 1	
			1759 13 6
			£3406 17 7

Edinburgh, 13th November 1895.—I have examined the Accounts of the Royal Scottish Geographical Society, for the year ending 31st October 1895, of which the above is an Abstract, and compared them with the Vouchers and Instructions thereof, and find the same correct and sufficiently vouched.

HUGH BLAIR, C.A.

Meetings.

There were in all 30 meetings during the Session, 15 having been held in Edinburgh, 5 in Glasgow, 5 in Dundee, and 5 in Aberdeen. These meetings were addressed by Sir Charles Tupper, G.C.M.G.; Sir William Conway; Dr. Hugh R. Mill; Sir W. Renny Watson; Vice-Admiral Colomb; Mr. John Smith; Commander Keane, R.N.; Sir William MacGregor, K.C.M.G.; Mr. Aubyn Trevor-Battye, B.A.; Colonel H. C. B. Tanner; Rev. John Ross, D.D.; Mr. G. F. Scott Elliot; and Captain Cayley Webster. In Edinburgh a paper by Captain Younghusband was read by Col. Cadell, V.C.; and Dr. W. Gunn, of the New Hebrides, delivered a Christmas lecture to young people.

A special meeting was held on 4th June to commemorate the departure of Sir John Franklin's Expedition, when a collection of relics of that expedition and other Arctic objects, which was shown and kept open during the four following days, proved an attraction to several hundreds of visitors.

Education.

Two courses of lectures were given, mainly for the benefit of teachers. The first of these, on "Scotland, Past and Present," was delivered at six meetings by Professor Patrick Geddes, and was well attended. The second was a set of four instructive lectures on "Mountains and Mountain Ranges," by Mr. H. M. Cadell.

The Society's Magazine.

The quality and usefulness of the Articles, Notes, and Reviews published in the *Magazine* has been fully maintained, and the Council desires to record its appreciation of the assistance rendered to the editors by the following lady and gentlemen:—Miss Scott Dalgleish; The Hon. J. Abercromby; J. G. Bartholomew; J. T. Bealby; F. Bosse; Dr. Jas. Burgess; H. M. Cadell; C. G. Cash; W. Eagle Clarke; J. Cockburn; Dr. Scott Dalgleish; Dr. Th. Delius; Dr. G. Dods; Malcolm Dunn; Dr. R. W. Felkin; Dr. T. W. Fulton; J. G. Goodchild; D. P. Heatley; A. J. Herbertson; Prof. C. G. Knott; J. W. M'Crindle; David MacRitchie; R. C. Mossman; Dr. John Murray; Ralph Richardson; Charles Robertson; Dr. George Smith; General Sir R. Murdoch Smith; J. Arthur Thomson; Dr. Tillie; Coutts Trotter; A. Silva White.

Library and Map Department.

During the past session 486 books, 156 pamphlets, 18 atlases, and 340 map-sheets have been added to the Library and Map-room. Nine new exchanges were arranged. The number of volumes borrowed by members was 2000. The expenditure amounted to £42, 13s. 9d., which included the cost of binding.

As in previous sessions, there has been an increase in the number of members making use of the Library, and many inquirers, both members and others, have visited the rooms to obtain information.

The Council desires to thank the Foreign and Colonial Governments who have continued to present official publications to the Library, and also private donors, among whom may be mentioned Mr. R. C. Bell; Mr. John Allen Brown; Dr. Alex. Buchan; Mr. H. M. Cadell; Professor Chiene; M. A. Delebecque; Dr. R. W. Felkin; Mr. G. H. Johnston; Mr. Clements R. Markham, C.B.; Mr. J. E. Mathieson; Dr. H. R. Mill; Mr. E. Delmar Morgan; Baron F. von Mueller; Dr. E. Poussié; Mr. R. Richardson; Mr. Hugh Rose; Mr. Coutts Trotter; Dr. D. Walker.

Geographical Museum.

A collection of geographical relics was commenced, at the time of the Franklin Commemoration and Exhibition, by donations, of which the principal were a collection of objects connected with Captain Weddell, received from Mr. J. Allen Brown, and a number of documents relating to Dr. Harry Goodsir of the *Erebus*, presented by Professor Chiene.

Place-Names Committee.

The Committee has met four times, and has now gone over all the Northern Counties of Scotland. At its next meeting it will take up the Mainland of Argyllshire, the only district regarding which the Director of the Ordnance Survey requires information at present.

The following gentlemen form the Committee :—Dr. Bannerman ; Mr. J. G. Bartholomew ; Dr. Christison ; Professor Eggeling ; Professor James Geikie ; Mr. Alexander Gow ; Mr. W. J. N. Liddall ; Sheriff Æneas Mackay ; Sheriff Dugald M'Kechnie ; Rev. Donald Masson, M.D. ; Mr. Hew Morrison ; Mr. John M. Rusk ; Mr. William C. Smith ; and Dr. James Burgess, *Convener*.

Corresponding Societies.

The Royal Geographical Society of Australasia (New South Wales, Victoria, and Queensland) has been granted the privileges of a Corresponding Society, and has extended similar privileges to the members of this Society.

The Society's Branches.

The Council desires again to acknowledge the valuable services rendered to the Society by the Honorary Officials of the branches at Glasgow, Dundee, and Aberdeen.

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